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Original Communications

RHYTHMIC CONTRACTIONS AND PERISTALTIC MOVEMENT IN THE INTACT HUMAN FALLOPIAN TUBE AS DETERMINED BY PERUTERINE GAS INSUFFLATION AND THE KYMOGRAPH*

(AN EXPERIMENTAL AND CLINICAL STUDY)

By I. C. RUBIN, M.D., F.A.C.S., NEW YORK CITY

THAT the fallopian tubes which are histologically not unlike the intestinal tube are capable of muscular contractions has long been assumed but never until very recently has this physiologic phenomenon been actually demonstrated. The reasons for this failure are due (1) to the circumstance that the motions of the tube are slow under physiologic conditions and under diseased conditions they are inhibited or paralyzed; (2) narcosis undoubtedly affects the tubal motions; the latter are so profoundly retarded and weakened by it as to be completely obscured.

Contractions of isolated strips of the excised tube have been demonstrated repeatedly on the kymograph since Kehrer's¹ classic experiments. It was, however through the physiologic experiments of George W. Corner² and his associates that renewed interest in the function of the tubes was aroused. They showed that there is a definite relationship between the rhythmic tubal contractions and the menstrual cycle, both of which depend upon ovarian function. Wislocki and Guttmacher³ independently of F. Kok⁴ were able to produce tubal contractions by immersing the intact uterus and tubes of pigs in oxygenated Locke's solution. Kok⁵ then demonstrated the same phenomenon in human tubes, but he found it necessary first to strip them of their peritoneal and ligamentous coverings.

Actual visible peristalsis can be produced in another way. By insufflating with oxygen the pig's uterus which has been immersed in Locke's solution, the tubes may be seen to exhibit rhythmic contrac-

*Read at the Fifty-second Annual Meeting of the American Gynecological Society, Hot Springs, Va., May 23-25, 1927.

NOTE: I am indebted to my chief, Dr. Robert T. Frank, and to Drs. George Streeter and G. A. Hartmann of the Carnegie Institute of Embryology, Baltimore, for a critique of my kymographic tracings and also for suggestions as to the proof of tubal peristalsis being recorded by uterotubal insufflation.

NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

tions. The tubouterine junction is most convenient for this experiment and about three inches of uterus with the tube attached is used. This for practical purposes is analogous to the human uterus and tubes. The cannula is inserted into the uterus and tied around the notch of the rubber acorn. The method of insufflation is precisely the same as used in the clinical test. The manometer registers a certain initial rise of pressure which drops as soon as the valve-like resistance offered by the tubouterine ostium has been overcome. With an attached kymograph the motions of the tube are then recorded. (Fig. 1.)

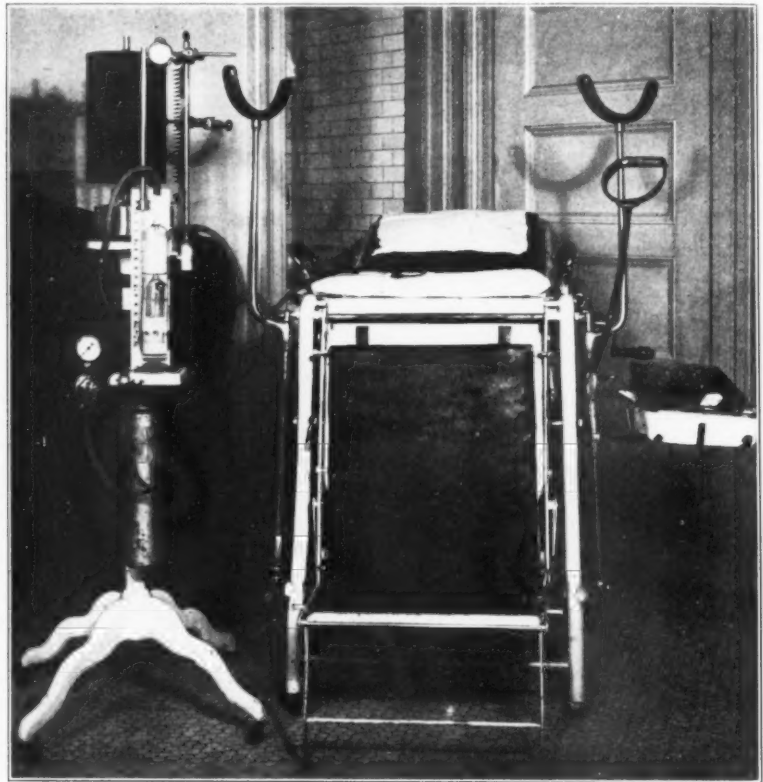


Fig. 1.—Kymograph with siphon-volumeter, carbon dioxide tank, reduction valve, rubber tubing attached with cannula resting on the table. Carbonized paper used.

The recurrent contractions cause a simultaneous rise of the mercury in the manometer and an upward stroke on the smoked drum. The release of the gas through the tubes is coincident with the muscular relaxation and is recorded by a descending stroke on the drum. The ascent and descent are steep or more sloping. The drop in pressure is characterized by sharp angles or gentle curves. (Fig. 2.) There is a certain regularity in time of occurrence and appearance of the contractions. Secondary contractions on the upward or downward

slope of the curves are also recorded. These small contractions are not always discoverable with the naked eye but the larger contractions are plainly visible and are synchronous with the recording instrument. The same results may be obtained when CO_2 gas is used, but in this case the specimen must be kept in oxygenated Locke's solution.

Although noticed in the early part of my work with tubal insufflation in 1919 and 1920,⁶ the interpretation of the fluctuations in the mercury column was nevertheless unsettled until two years ago. In May, 1925, I began the study of human tubal peristalsis by recording on the revolving drum the variations in pressure coincident with the passage of the gas through the uterus and tubes. Guthmann⁷ was the first to my knowledge to express the opinion that the manometric fluctuations were due to tubal peristalsis. His reasons were based on the well-known observation that when the tubes are closed, fluctuations in the manometer are not observed. This fact to his mind excluded the uterus as a factor in the production of the pressure fluctua-

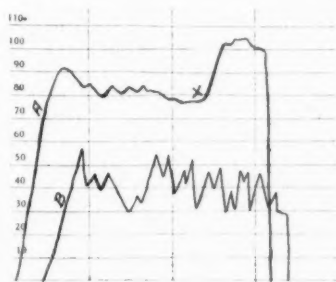


Fig. 2.—Kymographic tracing made during peruterine tubal insufflation in two cases. Note the difference in the initial pressure rise and the character of the curves in A and B. (A) Showing the gentle curve described at the initial drop in pressure. (X) Marks point where patient made a voluntary effort at straining. Up to this point patient breathed naturally, abdominal muscles relaxed. There were no deep pressure fluctuations. (B) Kymographic tracing showing sharp initial pressure drop 56 mm. Hg. to 41 mm. Hg., and then typical fluctuations of normally patent tubes.

tions. No experimental work was done to support this simple explanation. It appeared, however, that other physical or mechanical factors inherent in the tubes or extraneous to them might be responsible for the manometric fluctuations.

Further proof was essential, therefore, to demonstrate that tubal peristalsis is in reality responsible for the rhythmic variations in pressure noticed during uterotubal insufflation. The following steps were necessary for this proof:

1. To perform uterotubal insufflation on the extirpated uterus and tubes.
2. To observe the effect of insufflation on surviving specimens of the human genital organs and those of lower animals with and without ligation of the tubes.
3. Reversed insufflation with special reference to the intramural portion of the tubes.
4. Exclusion of uterine cause of contractions by experiment on the excised organs.

5. The factor of tubal elasticity and of superimposed weight.
6. To observe many clinical cases in which tubal insufflation was carried out with aid of the kymograph, and a control series in which lipiodol was injected into the uterus.
7. To exclude other factors, such as respiration, cardiovascular and extraneous intraabdominal pressure including intestinal contact.
8. The effect of varying the rate of flow of the gas.
9. Effect of direct intraperitoneal injection of the gas.
10. To note the changes in the phenomenon by doing preoperative tubal insufflation followed in the same individual by insufflation during laparotomy; and in case of an hysterectomy upon the extirpated specimen.
11. Evidence derived from abdominal auscultation.
12. Radiologic evidence of tubal peristalsis.

Insufflation of the Extirpated Uterus and Tubes.—It was found that when gas was allowed to pass through the excised uterus and tubes the

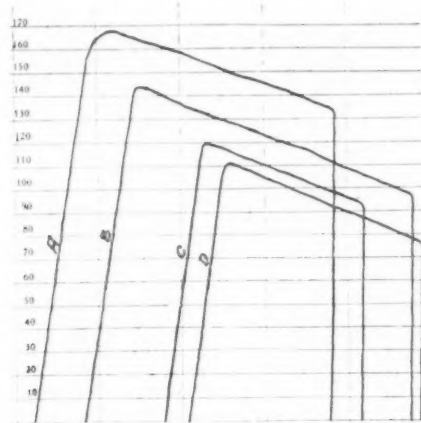


Fig. 3.—Shows the character of the kymographic tracing made during peruterine tubal insufflation of nonsurviving specimen of uterus and tubes. The initial pressure rise before gas escapes through the tubes is lower with each successive insufflation as seen in A, B, C, and D. No fluctuations in pressure are noted as the gas passes through the tubes. (cf with Fig. 2.)

pressure would rise to normal limits when the tubes were patent and then drop to a certain level, where it would be maintained for as long a time as gas was passing through the tubes. (Fig. 3.) *There was no tendency in the dead specimen for the passage of the gas to cause pressure changes.* The gas was seen to escape in bubbles of practically even size and rate. In the freshly extirpated human organs there was a slight tendency for pressure changes (Fig. 4) to be described on the drum for a short time.

Effect of Insufflating Surviving Specimens of Human Genital Organs.—In favorable cases where the uterini and tubes had been kept in Locke's solution and the gas was passed through them immediately or only a few minutes after their removal, tubal contractions were also seen with the naked eye. These contractions were, however, best seen

when the specimen was kept in warm Locke's solution (temperature 98.6° to 102° F.) during the time gas was allowed to pass through it. They were simultaneous with the upward rise of mercury pressure and the upward stroke of the curves as recorded on the drum. During relaxation the pressure dropped. It was also seen that the gas would either stop escaping from the fimbria during the period of tubal contraction or appear only in the gentlest stream of small bubbles. The moment the contraction ceased the gas at once escaped in large, rapidly succeeding bubbles making the characteristic gurgling, bubbling sound heard when one auscultates at the anterior abdominal wall during peruterine tubal insufflation. It will be remembered that the pressure-rate-flow is constant in these experiments and the flow of gas is regulated by a reduction valve.

When human fallopian tubes are ligated or clamped off at any point from the uterine insertion to the fimbria, there result no fluctua-

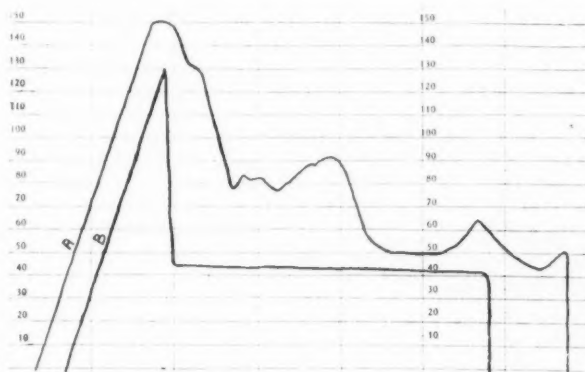


Fig. 4.—(A) Shows an occasional contraction of the tubes in a specimen insufflated immediately after removal from the body. The initial pressure rise being 151 mm. Hg. (B) The same specimen when grasped with bullet forceps. Leakage through bullet hole in uterus. The gas escaped through the bullet hole at 128 mm. Hg. and none passed through the tubes. Not the slightest tendency at contraction waves was noted showing that the uterus itself does not exhibit contractions during uterotubal insufflation.

tions. In the latter instance the tubes become distended and though the pressure may reach 200 mm. Hg. there is no reaction on their part; they remain paralyzed for the time being by the distending gas. If the pressure is released step by step, 10 mm. Hg. at a time, by means of a release valve (the tubes being kept closed) down to the lowest pressure levels, no fluctuations are produced. Nor do they appear when the gas is allowed to regurgitate through the cervix at one and the same or at different levels of pressure. When, however, the tubes are freed of the clamps or of the ligatures and physiologic conditions are restored they again appear simultaneously with visible peristalsis. The latter may be somewhat altered at first owing to the momentary injury, but they rapidly regain their "normal" or pre-

vious, undisturbed character. These experiments would appear to indicate that for the demonstration of peristalsis by peruterine insufflation the tubes must be patent. In repeating this experiment on the pig's oviducts the findings were practically the same with one exception. Feeble peristalsis was seen when the pressure of the gas was reduced to 50 or 60 mm. Hg., an avenue of escape for the gas being provided by slightly opening up the needle-valve.

The Question of a Uterotubal Valve Action.—The tubes shut down upon the gas in a gradually and progressively segmental manner. Whether the fluctuations in pressure are also influenced by a possible successive opening and shutting of a valve such as Lee has described at the tubouterine junction was not quite clear. It remained, therefore, to conduct the experiments in the reverse way; that is, to insufflate through the fimbriated end of the tubes and towards the uterus. Peristalsis was produced by this procedure and had the same character as when produced by uterine perfusion.

In the case of human tubes, contractions sometimes ceased completely when the intramural portion of the tubes was cut away. In the case of pig's, contractions continued even when only a short piece of the isthmie portion of the tubes was left intact and ceased altogether when the tube was removed on the distal side of the isthmico-ampullary junction. In another series of experiments the tubes were excised just external to the intramural portion, and the uterus was insufflated. Under these circumstances fluctuations were observed. When the intramural portion was cut away, however, the initial pressure was slight, the gas escaping through the uterine horn under very low pressure and without exhibiting any variation in pressure that might suggest rhythmic contractions. The same results were found in experiments upon the excised uterus and tubes of the pig. A certain degree of tonus appears therefore to be maintained at the tubouterine junction which must first be overcome before the gas can pass from the uterine cavity to the tubes, and further that it acts like a valve opening and closing in rhythmic fashion. There is other evidence, chiefly radiologic, pointing to the existence of a sphincter-like apparatus at the tubouterine junction corroborating Lee's findings in animals. The tonus appears to vary in different individuals and at different menstrual phases in the same individual.

The contractions are seen to begin in practically all cases at the fimbria and to extend toward the uterus. Irregular contractions and antiperistalsis have been observed and confirm the observations of Wislocki and Guttmacher.

Exclusion of a Uterine Cause of Contractions.—Exclusion of the uterine cause of the manometric fluctuations is a simple thing to accomplish in the extirpated genitalia by ligation or temporary clamping

of the tubes. The uterus appears motionless in all experiments. It is seen to distend and become tense and when the pressure is relieved, expels the gas through the cervix by an elastic rebound.

Clinically a genuine uterine contraction may however also occur and may account for the escape of the gas. I have the impression that in some instances the uterus exhibits a tendency to contract before a pressure is obtained which is sufficient to force the gas through the uterine ostium of the tubes. Frequently in cases of tubal patency there is a slight regurgitation from the cervix simultaneously with the initial drop of pressure. It is possible that when the tubouterine opening is "forced" a certain degree of uterine contraction is provoked.

To exclude the uterus as a possible cause of the rhythmic contractions noticed in clinical uterotubal insufflation the test was first carried out on the patient in the usual way. The initial pressure rise and the initial drop of pressure were carefully noted. Having in this way established the degree of patency of the tubes the uterine cannula



Fig. 5.—Specimen immersed in warm Locke's solution, temperature 102 degrees F. Oxygen insufflation through the uterus and tubes, initial pressure rise to 100 mm. Hg., whereupon gas was seen to escape from both tubes describing curves on the kymograph. These are practically of the same character as noted in the clinical tubouterine insufflation. (cf. with Fig. 2.)

was removed from the uterus and a rubber balloon was fitted over it. The balloon was then inflated to see whether it could sustain a pressure of 200 mm. Hg. without rupturing. For our purpose Penrose tubing was used as it is thin and can be rolled around the cannula so that it may be easily introduced through the cervical canal into the uterine cavity. The same gas rate flow was used to inflate the balloon as was previously employed in the test. (Fig. 5.) The balloon was then inflated till the same pressure was reached which had been found to be adequate for overcoming the resistance of the uterine ostia of the tubes. The pressure was then raised in order to note any change in the manometer, and it was also lowered. This was repeated in an ascending and descending scale from maximum pressure tolerance to the point where the rubber balloon was collapsed. Under these conditions, once the pressure reached the desired point it was maintained by closing the gas valve, and though the drum was allowed to revolve, the writing point described a horizontal line or a very gentle slope (if the slightest leak was present) but no fluctua-

tions were seen. (Fig. 6.) The balloon was withdrawn each time at the point of pressure maintained during the inflation in order to be sure of its intactness and its distention. The experiment is practically the same as the procedure described by Rucker in testing the effect of pituitary injections on the parturient uterus.

These experiments proved that unlike the tubes the nonpregnant uterus did not exhibit rhythmic contractions under the same circumstances, i.e., peruterine tubal insufflation.

The Possible Factor of Tubal Elasticity as a Cause of Manometric Fluctuations.—Were it not for the fact that actual rhythmic contractions may be seen in the surviving organs during the time the gas passes through the open tubes, the factor of elasticity might theoretically, at least, be assumed to be a cause of the manometric fluctuations. That a definite contraction relaxation mechanism is necessary

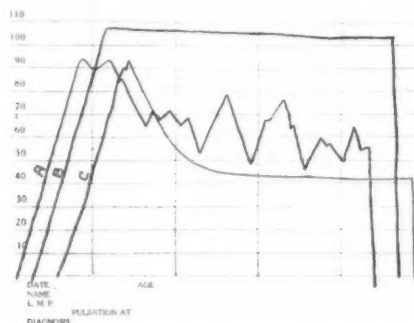


Fig. 6.—Curve A shows a practically normal tracing of peruterine tubal insufflation in a case of patent tubes. (B) A rubber balloon having been fastened over the cannula and introduced into the uterus of the same patient immediately after tracing (A) was made, shows an absolute lack of contraction waves. (C) The release valve being gently opened with the gas flowing continuously, shows a complete absence of contraction waves.

to produce the rhythmic changes on the kymograph, a property inherent in living muscle has already been shown by the complete absence of such fluctuations when dead tubes are insufflated. The experiment, however, has been further reproduced by using rubber tubing. It was seen that when the latter was freely open the gas passed through in an even plane. When different weights were placed upon them the gas rose to a certain pressure adequate to overcome the resistance of the superimposed weight and then dropped in an even line without exhibiting the slightest trace of curves. This also excludes the possibility of the weight of the intestines causing changes in the intratubal pressure. In experiments with the pig's uterus and tubes an analogous condition was reproduced as is found in the abdomen. The uterus coils up tremendously when inflated and if the tubes be placed under these coils during the insufflation they exhibit

the same type peristalsis and the same pressure fluctuations as when they are entirely freed from the weight of the uterine coils.

Observations on Clinical Tubal Insufflation.—Observations in some 650 cases where peruterine insufflation was carried out in conjunction with a recording drum have thrown added light and have confirmed the evidence adduced from the experiments. The findings are in general of two types: (1) Fluctuations of the manometer are present and these are recorded on the revolving kymograph. (2) Fluctuations are absent. The first is practically or always associated with other evidence of tubal patency, such as subphrenic pneumoperitoneum, auscultatory signs and phrenic shoulder pains. The second is found in cases where all the other evidence points to closed tubes or at least

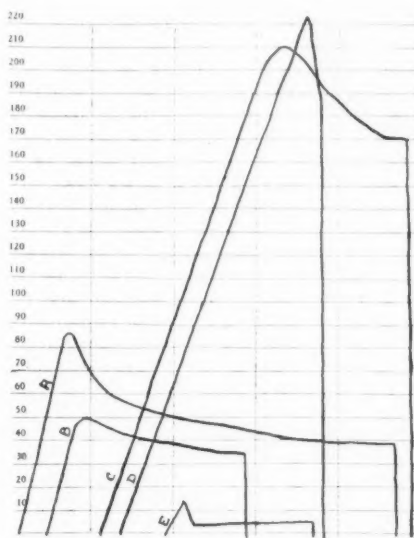


Fig. 7.—Shows tracings of insufflation of fallopian tubes removed several hours before and assumed to be dead. To note effect of external constriction weights are placed upon the tube. (A) Shows the effect of placing a 1.1 lb. weight over the tube, the initial pressure rise being 85, gentle drop as the gas passes through the tube. (B) Second attempt at insufflation with the same weight, initial pressure rise 49 mm. Hg. (C) 2.2 lbs. weight placed on tube, initial pressure rise 207 mm. Hg., gentle drop of pressure as gas passes through tubes. (D) The same weight placed near the uterinetubal junction, initial pressure rise 220 mm. Hg., when the weight was removed as the gas passed through. (E) Shows a tracing of insufflating a dead tube without a superimposed weight.

to a high grade stricture. In order to check up this factor and without subjecting the patient to a laparotomy I injected lipiodol into the uterus of fifty patients who had previously been examined for tubal patency by the method of uterotubal persufflation and had been found to have nonpatent tubes or an organic stricture. The fallopian tubes of this group of patients were either obliterated at the uterine end or sealed at the fimbria. In either case the manometer failed to register fluctuations. The radiographic evidence obtained confirmed the findings of the gas insufflation, that is, an obstruction in the tubes.

This presence or absence of mercury fluctuations during peruterine insufflation may therefore be taken as additional evidence in favor of or against the fact of tubal patency.

Other Extraneous Factors Which Influence Manometric Fluctuations.—When the gas enters the peritoneal cavity through the tubes, changes in intraabdominal pressure can also be recorded. When the tubes are closed, such intraabdominal pressure changes cannot be recorded. There are circumstances when, for reasons which will be taken up later, the fluctuations are slight or irregular and it is somewhat doubtful whether the tubes are open. If when in such case the patient is asked to bear down voluntarily there is a simultaneous rise in pressure it is evidence that the gas has succeeded in entering the peritoneal cavity. (Fig. 7.) Coughing, sneezing, or very deep breathing may produce similar pressure rises when the tubes are freely patent or only partially occluded.

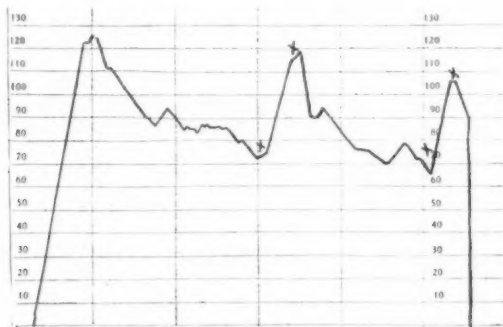


Fig. 8.—Shows a tracing in the case of tubal stricture without complete occlusion. Initial pressure rise 125 mm. Hg. with very faint irregular contraction waves. At (X-X) patient was requested to bear down with the resulting rise of pressure 40-45 mm. Hg. in depth.

When the gas passes through stenosed or partially strictured tubes the initial pressure being 160 to 200 mm. Hg. and a slight or sharp drop is noted, there will be no fluctuations. But voluntary straining produces slight pressure rises as the gas passes through into the peritoneal cavity. (Fig. 8.) An exception to this rule is offered by the case of closed tubes and a large, atonic uterus which is so distended by the gas as to allow the abdominal wall to press upon it and so cause a rise in the mercury column. This is readily demonstrated by filling the urinary bladder with gas and making manual pressure over it or asking the patient to strain.

When the initial rise of pressure is within normal limits and no fluctuations are observed but as the patient bears down there is at once a distinct increase in pressure as registered on the drum, it is presumptive evidence that the tubes are patent but probably not functioning normally. The same holds true in the presence of cervical

regurgitation. The latter is sometimes confusing in the performance of the insufflation test. When voluntary bearing down efforts or coughing produce pressure changes in spite of the regurgitation and they are also recorded on the kymograph, they may be taken to indicate that the tubes are patent.

A different picture is presented in the presence of spasm of the tubouterine junction. In this case the initial pressure rises to well above 100 mm. Hg. usually to from 140 to 180 or even 200 mm. Hg. The pressure falls to 140 or less in a gradual descent or sharply to a lower level when fluctuations more or less typical are exhibited. This may not be repeated on a subsequent insufflation. The strictured tubes, however require practically the same relatively high initial pressure before the gas passes through them in any test, and because of their rigidity due to adhesions or muscular infiltration they do not permit of rhythmic contractions. Studies in the effect of certain pharmacologic substances on spasm and peristalsis in general have not yet been undertaken but await systematic trial.

Respiration does not appreciably influence the manometer during uterotubal insufflation. The curves produced by tubal contractions upon the inflowing gas are out of all proportion to the respiratory rate; being three, four, or at the most, nine to the minute, as against sixteen to eighteen or more respirations per minute. Control observations of the breathing and the manometer show them to be entirely independent of each other, normal respiration scarcely entering into the process. By asking the patient to breathe rapidly or more slowly and deeply it has been noted that the manometric fluctuations are unaffected. Nor does conversation on the part of the patient during the kymographic tracing influence the character of the curves.

Effect of Varying the Rate of Flow of the Gas.—The question as to what extent the rate of flow of the gas affects the character and frequency of the manometric fluctuations was settled by varying the rate of flow in the same case. After establishing the "normal," i.e., with the usual pressure-rate-flow, the gas was allowed to flow in faster for a short while; then more slowly. Within certain limits, that is those set down for the safe performance of peruterine tubal insufflation, the character of the fluctuations is unaffected as far as the rate is concerned, but they cover a much wider pressure range, maintaining a higher pressure level when the rate of flow is accelerated. A very slow stream of gas does not register the typical curves because not sufficient pressure is maintained within the uterus and tubes for this apparatus, at least, to record them. The more rapid rate influences the curves very little because the minimum pressure is maintained.

Effect of Direct Intraperitoneal Injection of the Gas.—In order still further to exclude the influence of respiration upon peruterine insuffla-

tion and some possible reaction of the peritoneum to the instreaming gas bubbles,* the gas was introduced into the peritoneal cavity by direct abdominal puncture under the same rate-flow as employed in peruterine insufflation. It was then seen that rapid, close pressure rises aggregating 20 or more per minute with a shallow amplitude were described. (Fig. 9.) As the volume of gas within the abdomen increased the fluctuations became closer, approximating 56 to 76 per minute. The respirations in this particular case, a debilitated woman who had had ascites, were noticeably increased and were synchronous with those closely recorded up and down strokes. It also appeared as if the heartbeat transmitted an impulse to this artificially produced air bag within the peritoneal cavity. Two thousand cubic centimeters of carbon dioxide were thus introduced into the abdomen. By comparing this curve with the several hundred obtained by the method of peruterine insufflation it was seen how absolutely it differed from

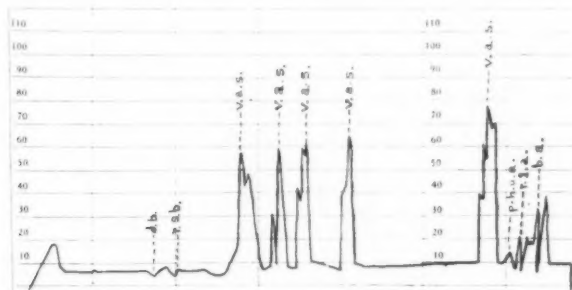


Fig. 9.—Cystogram (300 c.c. of carbon dioxide introduced into the bladder at the same rate of flow as employed in peruterine tubal insufflation in a patient with an artificial vagina). (d.b.) Shows effect of deep breathing; (r.s.b.) shows effect of rapid shallow breathing; (v.a.s.) shows effect of voluntary abdominal straining causing marked rises in pressure, but there were no fluctuation waves as recorded in the normal peruterine insufflation; (p.h.a.) shows effect of pressure with hand over upper abdomen; (r.l.a.) pressure with hand over right lower abdomen; (b.a.) pressure with hand over bladder area.

any and all of them. In one other case where this procedure was repeated practically the same results were obtained.†

Preoperative, Cooperative and Postoperative Insufflation.—It was further desirable to note the behavior of the mercury column in the same case (1) by preoperative uterine insufflation, (2) insufflation during laparotomy, and (3) in the event of the uterus being removed, upon the extirpated specimen itself. The object of this was to see whether the character of the contraction waves differed materially when the abdomen was opened and also to note the change wrought by the anesthesia. Accordingly in two cases it was possible to do a peruterine insufflation before laparotomy and before the narcosis was administered; then to repeat it without removing the uterine cannula

*This possibility was suggested by Dr. Carl Hartmann.

†Cases from the Montefiore Hospital where a pneumoperitoneum was desired for diagnosis.

under identical conditions when the patient was deeply anesthetized and the abdomen open. Inspection of the tubes failed to elicit any motion. The curves described were shallow and slower, if they appeared at all, than in the normal state. The specimen itself exhibited the same type curves when removed from the body as it produced before the patient was anesthetized. These findings showed that the contraction waves seen on the kymograph during the clinical application of tubal insufflation are due to a mechanism residing within the genitalia themselves and further that tubal peristalsis is responsible for them. (In performing this experiment one has to be careful in handling uterus and tubes as manipulation naturally will produce pressure changes.)

Evidence Derived from Abdominal Auscultation.—In carefully studying the sounds produced within the abdomen by the passage of the gas through the tubes, it was found that there were definite silent intervals between a succession of sounds. In the specimen itself the bubbles of gas were seen to escape in two types of streams; one, a rapid stream

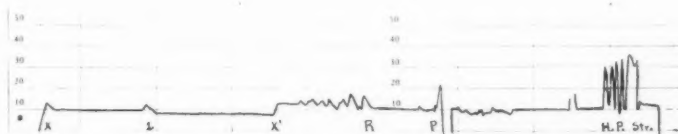


Fig. 10.—Showing tracing of direct intraperitoneal insufflation of abdominal puncture. Very shallow irregular curves with distinct rises when pressure is made over abdomen with the hand, or the patient strains deeply as noted at (*H.P.Str.*). *X* marks the point where eight pulsations of a siphon-meter were recorded, primary rate flow 30 seconds per pulsation increased at (*L*) to 25 seconds and at *X'* to 5 seconds. *X'*—*R* marks normal breathing. At *P* the trocar was pressed into the peritoneal cavity as it was thought that the gas was leaking.

of rather large bubbles making a loud noise; and the other, a stream of slowly escaping small bubbles making a much lower-pitched sound. Frequently a silent interval followed the high-pitched sound. The same findings were obtained in abdominal auscultation during the insufflation. These sounds were synchronous with the curves on the drum. It was possible practically every time to tell from the character of the sounds whether the curve was upward or downward, an assistant watching the kymograph while one listens with the stethoscope over the anterior abdominal wall. This finding may also be taken as an indication of tubal contractions and therefore of tubal patency. If one listens over the abdomen when the tubes are closed he will fail to hear these sounds, a fact already brought out by Henderson and Amos in 1921.⁸

Radiologic Evidence of Tubal Peristalsis.—To these findings, radiologic studies have brought the last and most striking proof of the clinical occurrence of tubal peristalsis. Dyroff⁹ thought he had demonstrated the fact of tubal contractions in one case by the appearance in

the x-ray film of "pearl-like" shadows produced within the tubes injected with lipiodol. A. J. Bendick and I¹⁰ have been fortunate in demonstrating tubal peristalsis by intrauterine lipiodol injection and studying the uterus and tubes with the aid of the fluoroscope. We found contractions of the tubes in 18 cases out of 30 studied. The tubes in some of our cases had previously been removed surgically and in the remainder of the series they were either stenosed or non-patent. These facts were first established by peruterine tubal gas insufflation as it was desirable to avoid injecting an excess of lipiodol, or any at all, into the peritoneal cavity itself. We hazarded this only

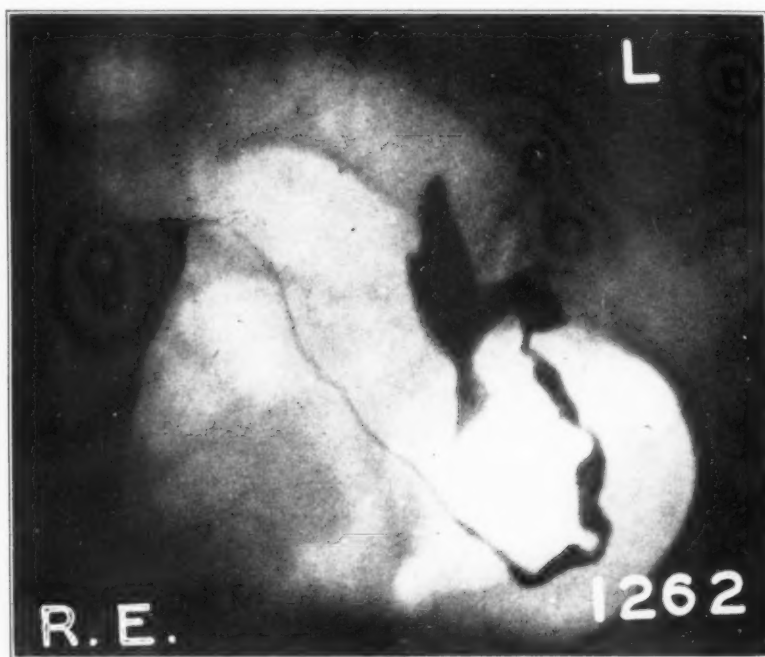


Fig. 11.—Shows tubal peristalsis of the left tube, lipiodol having been injected through the uterus. The frimbriated end of the tube is beautifully shown. Note also the increased length of the tube.

in a small number of our cases where a tight stricture was diagnosed by the gas test and only the slightest amount, one or two c.c. at most, of the lipiodol might find its way into the abdomen.

A point of difference between using gas and using lipiodol or any other radiopaque substance in the diagnosis of tubal peristalsis is the fact that when the tubes are distended with the gas they become paralyzed for the time being. For the fluoroscopic visualization of tubal peristalsis with lipiodol, however, the tube lumen does not have to be distended with the fluid, a small amount sufficing so that the tube muscle retains its peristaltic action. The movement of the fluid can be readily observed under the fluoroscope. (Fig. 11.)

It may be interesting to note that the uterus filled with lipiodol partly or to the point of distention does not change its shape as far as we can make out. In lower animals, however, well marked uterine contractions have been seen when the uterus is filled partially or completely with lipiodol. Further observations on this particular point are under way at the Roentgen Department of Mt. Sinai Hospital in collaboration with Drs. Kross and Snow.

SUMMARY AND CONCLUSIONS

Tubal contractions occur in the presence of normal patency. These contractions can be studied by means of uterotubal gas insufflation and the kymograph. The gas streaming through the tubes at a constant pressure-rate-flow acts as an elastic body upon which tubal contractions register varying degrees of pressure. The character of the contractions is but little affected by the gentle inflow of the gas as comparison with the phenomenon in the surviving specimen without gas insufflation has shown. A rapid flow can cause a certain amount of irritation and is of course to be avoided. Rhythmic waves recorded upon the kymograph and manometric fluctuations indicate in an objective way the presence of tubal contractions. These are absent when the tubes have been ablated or are closed or strictured at any point of its course from the intramural portion to the fimbria.

They are totally absent in the dead specimen of human uterus and tubes. They are not due to uterine contractions which in the nonpregnant state have so far not been demonstrated. This holds true whether the uterine cavity is inflated by means of a closed balloon or whether the inflating gas has free passage as when the tubes are entirely removed from the uterus. The kymographic curves are produced by rhythmic tubal contractions and are not due to elasticity of the tube walls, as they cannot be reproduced by passing the gas through rubber tubing.

They are further evidenced by periodic auscultatory signs through the abdominal wall during the act of insufflating. Bearing down, coughing, sneezing, or any violent diaphragmatic or abdominal muscle contraction influences the kymographic curves slightly but distinctly only when the tubes are actually patent. When the latter are non-patent these extraneous muscular efforts have no effect upon the kymographic curve.

In the absence of tubal patency and tubal contractions, the kymographic record describes an upward slanting line, and when the highest pressure point is reached it describes a horizontal line which drops when the cannula is withdrawn from the uterus.

The evidence so far adduced points to the fact that certain conditions influence their character and occurrence. In the presence of spasm an initial high pressure is followed by a drop in pressure which

is succeeded by the appearance of regular rhythmic contraction waves on the kymograph. Narcosis has been demonstrated as definitely lessening the rate and amplitude. In the presence of cervical regurgitation and the absence of fluctuations, bearing down efforts on the part of the patient will settle the diagnosis. If the pressure rises as a result of these straining efforts it indicates that the tubes are patent but their peristaltic motion is impaired. In cases of doubt this has proved a valuable aid.

Since tubal contractions depend upon ovarian activity their character changes with the particular phase of the menstrual cycle. I have found them also to be definitely affected by such conditions as grave functional amenorrhea in young women and by the preclimacteric and climacteric state. In these conditions the kymographic curves are shallow if at all present and are less frequent to the minute. In many cases of sterility associated with amenorrhea, however, manometric fluctuations are present during tubal insufflation and sometimes they are well marked, resembling the behavior of normal tubes. Although no parallel investigation of the presence and content in the blood of female sex hormone has been carried out in these cases, which appears to be a most desirable procedure, the results here obtained point to retention of tubal peristalsis without sufficient hormone present in the same case to activate the uterus to the full degree of menstruation. Repeated tests of tubal peristalsis have not been undertaken clinically to study the variation in contraction rate and frequency per minute as has been done with excised organs and strips of organs. Such a procedure as blood examination, if systematically carried out, as was done by Dr. Robert T. Frank and his associates for female sex hormone, would yield data that might prove of great help in diagnosing tubal and ovarian function. The findings so far point to the possibility of arriving at a simple diagnostic test of one phase at least of ovarian function; namely, that which influences tubal contractions and therefore ovular transportation.

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261 CENTRAL PARK WEST,

OBSERVATIONS UPON THE COEXISTENCE OF CARCINOMA FUNDUS UTERI AND PREGNANCY*

By EDWARD A. SCHUMANN, M.D., F.A.C.S., PHILADELPHIA, PA.

CARCINOMA of the cervix complicating pregnancy is a well-known though fairly uncommon lesion, but the association of adenocarcinoma of the fundus uteri and pregnancy seems not to have been observed, and the possibility of its occurrence is usually dismissed by pathologists with the statement that such combination is impossible.

O. Sarwey¹ says that it is unthinkable that carcinoma of the fundus and pregnancy can coexist, since even though it might theoretically be possible that conception could take place during the incipency of carcinoma, still the development of the ovum in a uterine cavity, the seat of carcinomatous degeneration, is impossible. He thinks that the earlier reported cases of J. Veit, Chiari, Müller, Bousquet, and Neyronis were probably chorioepithelioma, which had been described by Sänger after their publication.

A review of the literature fails to disclose any detailed reports of cases of this combination, although Müller² states that carcinoma of the uterine body is a very rare complication of pregnancy, since the presence of the neoplasm in the fundus acts much more as an inhibition of conception than does the cervical form. When such cases do occur, he says, the growth is usually found springing from the placental site and ordinarily results in abortion. Müller cites two cases of his own, which are not detailed, and one each of Veit and Chiari.

It is difficult to understand just why this coincidence does not occur more frequently. Women subject to carcinoma are said to be beyond the childbearing age usually. But there are many, many cases in which the patient is under forty and still in the full possession of her reproductive powers. Again it is believed that the degenerated carcinomatous endometrium cannot furnish the proper nidus for the ovum, but inasmuch as we know that adenocarcinoma is commonly a small, sharply circumscribed growth for a number of months and that during this period the remainder of the endometrium has undergone no appreciable change, it would seem that such degeneration need not necessarily preclude the possibility of pregnancy. The chemical reaction of the uterine cavity may possibly be altered in the presence of carcinoma, but there is no evidence that this is true. One is rather tempted to believe that possibly those instances in which adenocarcinoma closely follows pregnancy and labor may, in-

*Read at the Fifty-second Annual Meeting of the American Gynecological Society, Hot Springs, Va., May 23-25, 1927.

deed, have been cases in which the carcinoma existed in its incipient stages during gestation.

Cullen³ believes that the occurrence of pregnancy has little to do with the origin of adenocarcinoma of the body of the uterus and reports nineteen cases of this condition, of which ten, or 52 per cent,



Fig. 1.—Curetted material, showing endometrium with marked glandular proliferation and worm arrangement.



Fig. 2.—Endometrium showing simple glandular hyperplasia and some endometrial reaction.

never had children. Seventeen of these patients were married, and it is a significant fact that six out of the seventeen have never conceived, a far higher ratio of sterility than is found under normal conditions. It is just possible that the cause that prevented conception is in some way responsible for the development of the carcinoma.

The clinical diagnosis is manifestly an impossible one, since slight bleeding during the early months of gestation will naturally be attributed to some pathologic condition of the ovum or its envelopes, and there is nothing else to call attention to the fact that an endometrial neoplasm may exist.

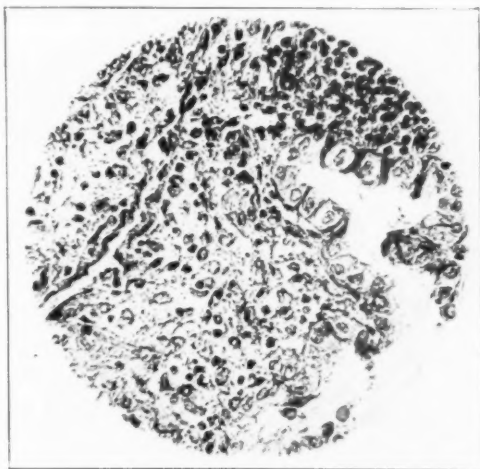


Fig. 3.—Section showing the syncytium with a cell islet at 1.



Fig. 4.—The decidua, high power.

The histologic diagnosis of the nature of the tissue also presents great difficulty. Endometrial reaction to the development of an ovum is so various in its form and the behavior of the epithelium often so closely simulates new growth morphology that a definite conclusion cannot often be reached.

The normal changes taking place in the uterine mucosa during early pregnancy are simply an exaggeration of the regular premenstrual alteration, and as Frank¹ clearly states, the mucosa hypertrophies greatly throughout the uterus, particularly at the placental site. Through this hypertrophy the interior of the uterus becomes mamillated and nodular. The stroma reaction is more uniform and greater in degree than that occurring before menstruation. The decidual cells are larger, and, therefore, in sections the tissue looks more like an epithelial than a connective-tissue structure. The glands show marked reduplication so that they are almost in contact in the spongy layer. In the compacta they are few in number, and some appear to have lost their connection with the uterine lumen.

In some instances hyperplasia with the formation of pseudopapillae of the epithelium takes place, giving rise to the so-called glands of

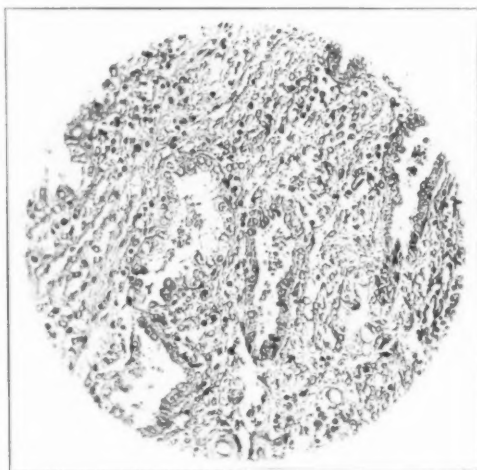


Fig. 5.—Decidua with scattered syncytial cells and some irregular and atypical uterine glands.

Gebhard. Microscopically the picture is startlingly like an epithelial newgrowth even in perfectly normal pregnancy.

Adenocarcinoma of the pregnant uterus may easily be mistaken for chorioepithelioma, especially the form described by Ewing as chorioadenoma; and, indeed, except for the typical glandular changes, the tissue here presented might well come under this classification.

The particular specimen which came under my notice was so puzzling that it was submitted to a number of pathologists, all of whom finally agreed that the cellular morphology and arrangement were definitely that of adenocarcinoma, and the diagnosis was generally concurred in.

The history of the case is as follows: C. J. D., aged forty-three, married, Italian, 10 para, was admitted to the Frankford Hospital September 18, 1925,

complaining of uterine bleeding and backache. Her past medical history and her family history were irrelevant. She had menstruated at the age of thirteen, regularly and normally. She had had ten normal labors the youngest child being two years of age; no miscarriages. The last menstrual period began twenty days before admission and had continued intermittently ever since, alternating with a thin, serous discharge. She had some pain in the back which did not radiate and some pain in the lower abdomen. She gave an indefinite history of a similar attack of irregular bleeding and leucorrhea five years previously.

General physical examination was negative, patient being a large, buxom woman, normal as to heart and lungs and with a somewhat pendulous, adipose abdomen. On vaginal examination, the vaginal outlet was multiparous, the perineum relaxed, the cervix hard and dense and without laceration, the uterus was large, boggy, movable, and forward in good position. The tubes and ovaries were negative. There had been no history of a missed menstrual period or any of the early phenomena of pregnancy. The provisional diagnosis was carcinoma fundus uteri. Under gas anesthesia, a gentle curettage was performed.

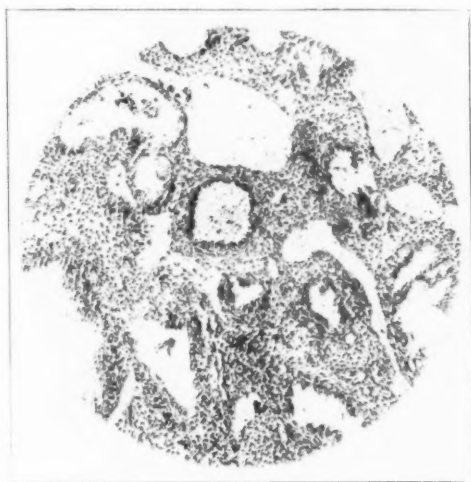


Fig. 6.—Section through the carcinomatous area showing irregular arrangement of glands and breaking of the limiting membrane.

Microscopic examination showed the uterine curettings to be composed practically entirely of glandular tissue, very markedly hypertrophied and showing very active growth, with many mitotic figures. There was a distinct breaking through of the limiting membrane in each case with an oozing, so to speak, of the glandular elements through the limiting membrane and a tendency to form new glands.

Pathologic Diagnosis, Adenocarcinoma of Uterus.—Upon this diagnosis abdominal panhysterectomy was performed on September 28. The uterus was uniformly enlarged to the size of a large orange, was soft and gave the impression of pregnancy. However, it was removed and on sectioning the organ it was found to contain a normal two and one-half months' pregnancy with the sac unruptured. Just under the lower border of the gestation sac was a grayish, necrotic area, limited to the mucosa, somewhat circumscribed to about 6 cm. in diameter. This area did not extend under the placenta, was not elevated above the surface, was not especially vascular, and was everywhere at least 3 cm. above the internal os, with which it had no connection.

The patient made a good recovery and was discharged from the hospital in two

weeks. On reexamination twenty months later the woman was found to be in good general health and presenting no evidence of metastasis or recurrence.

The uterus was submitted to Dr. William M. L. Spaeth, pathologist to the hospital, who presented this interesting report: "The specimen consists of the uterus, both tubes and both ovaries. There is also present in the specimen what appears to be a three months' fetus and the placenta with its membranes intact in addition to a large amount of blood clot. On examination of the uterus we find that it is approximately the size of a four months' pregnancy, that it is very soft and friable, that the portion of endometrium about 3 cm. above the cervix has been everted away and that the fundus below the ovum contains a distinct sloughing cauliflower-like mass. This mass is very intimately attached to the underlying tissues and before it separates from the tissue it breaks, leaving a rough granulated appearance. The confines of the mass are rather well marked 1 cm. beneath the endometrium.

"The cervix presents evidences of old, healed lacerations and many Nabothian cysts. Both tubes are present in the specimen as are the ovaries, but outside of the fact of a few retention cysts in the ovaries there are no gross changes. The fetus measures approximately 8 cm. in length, and the placenta seems to be intact.

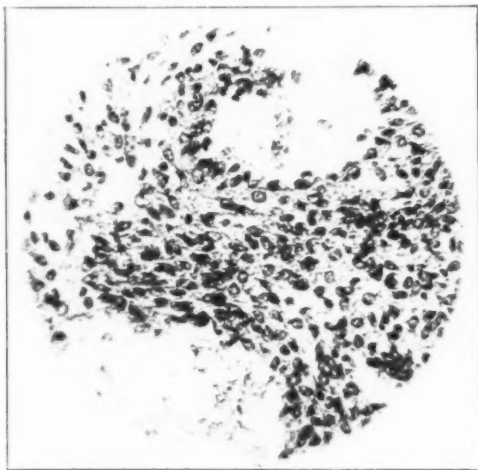


Fig. 7.—High power section showing a mass of epithelial cells, partially divided by stroma and showing only a faint gland-like structure. Many of the cells are broken up, many show mitotic figures.

"Microscopic examination shows a very marked hypertrophy of all the glandular elements of the endometrium. There is a very active overgrowth of all the cells with rapid growth and the production of many mitotic figures. There is a tendency to the formation of many new glands. In addition we find areas which show true placental tissue. The uterine musculature shows much fatty degeneration. The cervix shows a marked degree of fibrosis and evidences of old lacerations and also chronic inflammatory changes. Both tubes show chronic inflammatory changes as do the ovaries.

Pathologic Diagnoses.—Adenocarcinoma fundus uteri; uterine pregnancy with placenta and fetus; chronic cervicitis; bilateral salpingitis (chronic); bilateral perisalpingitis (chronic); bilateral oophoritis (chronic); bilateral perioophoritis (chronic); bilateral cystic degenerations of ovaries."

A critical examination of many sections revealed certain characteristics which were definite and peculiar to this growth.

There were present normal decidua, a normal placenta and fetus. Pronounced stroma reaction was found with many large decidual cells and cell islets.

The glands were much reduplicated, showing marked hyperplasia, but throughout there was a breaking through of the limiting membrane and a massing of the epithelial cells outside the confines of the glands, with the typical rain-worm-like convolution of the latter and markedly irregular mitotic figures.

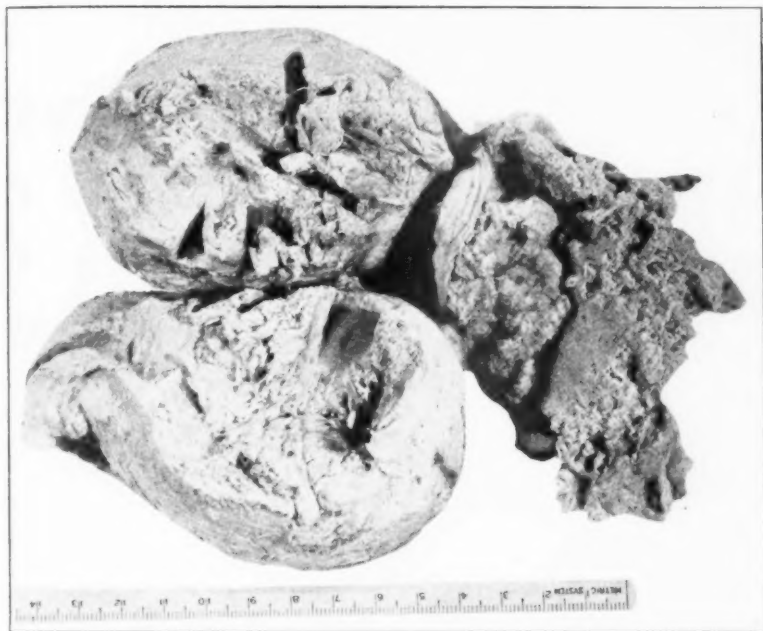


Fig. 8.—Gross specimen. Placenta shown above. Fetus has been removed.

This glandular arrangement was characteristically that of adenocarcinoma and upon it the diagnosis was made of that form of neoplasm as differentiated from chorioepithelioma.

The tumor was entirely extra placental, which is not usually the case in chorioepithelioma nor was there any evidence of the existence of a second placenta, from a twin pregnancy.

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1814 SPRUCE STREET.

CARCINOMA OF THE UTERINE CERVIX*

BY HENRY SCHMITZ, M.D., F.A.C.S., CHICAGO, ILL.

IT IS impossible within the time allotted to render a complete discourse on carcinoma of the uterine cervix. The study of the disease, however, offers many practical and important fields, as: (1) The relation of infections of the cervix and of pregnancy to the etiology and the prophylaxis of cervical carcinomas; (2) the study of the extent of the carcinoma in its influence on prognosis and treatment, and (3) the histopathologic character of the tumor tissue and its relation to the prognosis and treatment. These three phases will form the basis of this discussion.

THE RELATION OF INFECTIONS OF THE CERVIX AND OF PREGNANCY TO THE ETIOLOGY AND PROPHYLAXIS OF CERVICAL CARCINOMAS

Several elementary facts may be cited which are of importance in the direct and indirect etiology of carcinoma and in the aim of prophylaxis.

A carcinoma never grows in healthy tissues and organs. It always has a focal beginning. It does not possess a limiting capsule like a benign growth but is infiltrating like the roots of a tree. The tumor forms a continuous dendritic cellular mass. Such growths probably arise from a subepithelial inflammation which stimulates the epithelial cells to proliferate. The chronic inflammation causes a decrease in the differentiation activity of the epithelial cells which then grow into the depths and become atypical.

The most common evidences of chronic inflammations of the cervix are erosions and hyperplasias—the results of infections—and of traumas or lacerations. The infections are mainly gonorrheal, but may be caused by other pyogenic bacteria. Infectious diseases of childhood and the infantile gonorrheal vulvovaginitis not infrequently cause chronic cervicitis. This is an important fact as one might overlook such an occurrence in a nondeflorated woman. In the multiparas infections and inflammations may occur by an ascending route if the vaginal introitus gaps. Bacteria and extraneous substances may find an entrance to the upper vagina. The continued chronic irritation then causes the same changes as mentioned above. A laceration of the cervix may indirectly predispose to chronic inflammation as the everted endocervical mucosa becomes irritated. The profuse leucorrhea may then macerate the squamous cells covering the vaginal

*Read at a meeting of the Chicago Gynecological Society, January 21, 1927.

portion of the cervix. The defect is covered with cylindrical cervical canal epithelium which can live in the discharge. The cervical erosion has been formed. Culbertson¹ states: "The sequence of development of erosions then consists of infection or trauma, inflammation, leucorrhea and papillary erosions." The varied cellular developments that characterize erosions in the several phases are evidenced in some instances by extensive proliferations of cells, the development and arrangement of which clearly place the condition at the line bordering malignancy, or show that malignant disease is definite: the so-called erosion carcinoma. In other instances the erosion may show a tendency to heal spontaneously when squamous-cell epithelium covers the previously formed glands on the portio. Nabothian follicles and cystic degeneration of the cervix result. The atypical cell proliferation is increased and is often accompanied by disordered growth, intense activity, rapid proliferation, and imperfect organization. Squamous epithelial cells are often seen deep in the glands. The glands may be so closely packed as to suggest strongly the direct development of the alveoli characteristic of malignant disease.

The deductions that may be drawn from these observations are: (1) Cervical erosions must be treated whenever discovered on examination, whether they do or do not cause symptoms. (2) Every parturient mother should be examined from eight to ten weeks postpartum, and if lacerations of the cervix or extensive relaxation of the vaginal introitus are found they should be repaired by Emmet's trachelorrhaphy and a perineorrhaphy. (3) Erosions that have existed for some years or are very extensive should be excised by a Sturmdorf operation or a high cervical amputation. Subsequent microscopic examinations of the removed tissues often show atypical squamous-cell or adenomatous proliferations that may present every histologic evidence of malignancy. Recent erosions may be successfully healed by the cautery method. However, erosions of wide extent or long existence should be treated by radical surgical measures. If found to be clearly malignant on subsequent microscopic examination then such cases should be treated accordingly. These conclusions, based on microscopic evidence, constitute the prophylaxis of carcinoma of the uterine cervix.

The relationship between pregnancy and the incidence of cancer has been investigated in four hundred consecutive cases of carcinoma of the cervix. The incidence of the number of pregnancies is shown in Table I.

It is apparent from Table I that about 60 per cent of the 400 cases of carcinoma of the cervix occurred in women who had had three or less pregnancies. It seemed possible that such paras were predominant in the United States. Therefore the number of pregnancies was determined in 400 women of cancer age but free of the disease.

TABLE I

	NUMBER OF PREGNANCIES IN CANCER OF THE UTERINE CERVIX		NUMBER OF PREGNANCIES IN 400 WOMEN OF CANCER AGE	
	NUMBER	PER CENT	NUMBER	PER CENT
Nulliparas	59	14.75	73	18.25
Primiparas	78	19.5	56	14.0
Secundiparas	53	13.25	60	15.0
Tertiparas	51	12.75	72	18.0
Nulliparas to tertiparas inclusive	241	60.25	261	65.25
Quadruparas	36	9.0	42	10.5
Sextiparas	34	8.5	28	7.0
Quintiparas	25	6.25	16	4.0
Septiparas	19	4.75	18	4.5
Octiparas	10	2.5	14	3.5
Noniparas	13	3.25	7	1.75
Deciparas	9	2.25	5	1.25
Undeciparas	4	1.0	4	1.0
Duodeciparas	2	0.5	2	0.5
Tertio-deciparas	3	0.75	2	0.5
Quartodeciparas	2	0.5	1	0.25
Quintodeciparas	2	0.5	0	0.0
Total	400	100.0	400	100.0

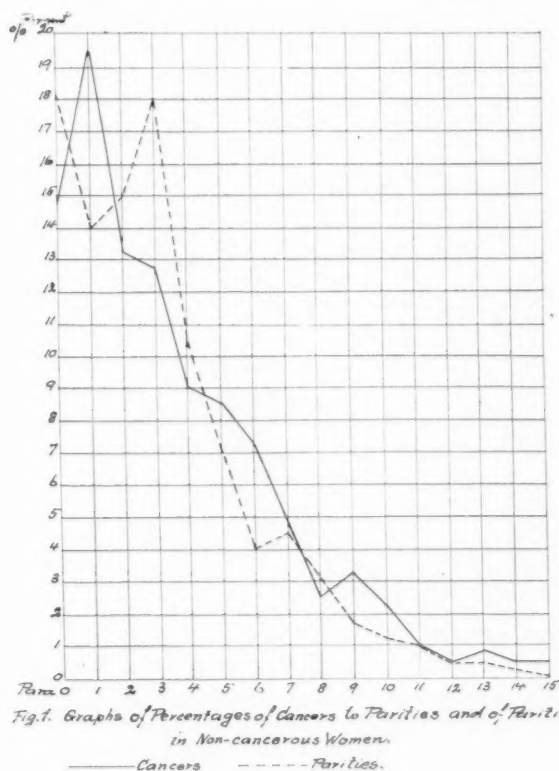
The results have been placed in the same table. It is interesting to note that the percentages of cancers in the various parities run almost parallel with the percentages of the parities in the noncancerous women. (See Fig. 1.) The teaching that women with many children have cancer relatively more frequently than sterile women or women with few children is therefore not supported by this study. Observations made in Central European families with many children may have led to this deduction on account of the greater preponderance of married women with four or more children in such countries.

We agree with Farrar² that the lacerations resulting from the trauma of labor predispose to carcinoma due to the atypical cellular changes occurring in such cervixes in the form of eversions and erosions. Kauffmann,³ in a study of 2000 cases of cancers of the genital canal, observed that no definite relationship between carcinoma of the cervix and the number of children can be established. Numerous births do not favor the appearance of cancer. Inflammatory disease resulting from infections, irritations from without, and traumas apparently are the predisposing causes of malignant disease of the cervix.

THE CLINICAL GROUPING OF CERVICAL CARCINOMAS

Cervical carcinomas should be grouped according to the extent of the disease. Such a grouping facilitates the formation of indications for the proper method of treatment and the study of the efficacy and prognostic value of therapeutic measures. It would seem desirable that some uniform method of grouping be adopted if the full value

of comparative studies is to be readily available. The classification used in our clinic¹ since 1916 is as follows: A, the primary; B, the recurrent; and C, the secondary carcinomas. The addition of the secondary carcinomas, as suggested by Ward and Farrar,⁵ has been adopted in the grouping. A recurrent carcinoma signifies a renewed activity of the cells after a preceding radium treatment, and a secondary carcinoma means a recurrence after panhysterectomy for carcinoma of the cervix. Table II describes the groups in each class and gives the method of treatment at present employed. Group 1 cases may be treated either with surgery or with radiations. Should such



cases prove to be poor surgical risks then radiations are indicated. Complications which contraindicate surgery are grave forms of constitutional diseases as tuberculous infections, diabetes mellitus, severe cardiac disturbances, diseases of kidneys, arteriosclerosis, asthenia, and so forth. The presence of virulent bacteria, especially streptococci, in the cervical secretion also forms a contraindication to hysterectomy. Such patients almost invariably succumb to septic peritonitis. Whether the Ruge-Philipp's virulency test will enable us to predetermine the pathogenic character of such invading bacteria is at

present under our investigation. About 20 per cent of cervical carcinomas show the presence of virulent cocci. Such cases are therefore treated with radium.

TABLE II
THE GROUPING OF PRIMARY CARCINOMAS OF THE UTERINE CERVIX

GROUP	PHYSICAL FINDINGS	INDICATED TREATMENT
1.	Clearly localized carcinomas	Surgery or radiation
2.	Borderline cases with wide or peripheral invasion of the cervix and a doughy consistency of the paracervical region	Combined use of radium and x-rays
3.	The clearly inoperable cases with induration of the paracervical tissues and the parametria which are not fixed	Combined use of radium and x-rays
4.	The terminal cases characterized by fixation of tissues or the frozen pelvis	Palliative and symptomatic treatment

TABLE III
GROUPING OF RECURRENT AND SECONDARY CARCINOMAS OF THE UTERINE CERVIX

GROUP	PHYSICAL FINDINGS	INDICATED TREATMENT
1.	Local recurrence, clearly localized	Combined use of radium and x-rays
2.	Parametrial recurrence, without local recurrence	Combined use of radium and x-rays
3.	Local and parametrial recurrence	Combined use of radium and x-rays
4.	Fixation of tissues	Palliative and symptomatic treatment

In a series of 183 cases of primary cervical carcinomas treated with a combination of radium and x-rays during the years 1914 to 1920 inclusive, the following results were obtained:

Groups:	1	2	3	4	Total
Total number:	10	21	93	59	183
Five-year healings:	8	7	11	0	26
Per cent:	80.0	33.3	11.8	0	14.2

If the untraced cases, namely 57, are subtracted from the total, then 126 cases were followed up for five years, a curability of 20.6 per cent.

The operable cases number 31 with 15 five-year end-results, or a relative curability of 48.4 per cent. The cases belonging to Group 4, characterized by a frozen pelvis or fixation of the tumor, have all succumbed to the disease. Such cases should not be treated with massive radiations with the expectation of arresting the growth of the tumor. They offer an absolutely bad prognosis.

The clinical grouping of cervical carcinomas, therefore, facilitates the selection of the proper method of treatment and offers a means for estimating the probable efficacy of the treatment.

It is interesting to compare results of treatment of cervical carcinomas in various clinics, dividing the cases according to the method of treatment. The percentage of relative cures means the number of operable cases well after five years.

In estimating the value of the three methods of treatment the percentages of the relative cures should be compared as they represent the number of five-year cures in the operable cases. The absolute cures mean the five-year cures obtained in all cases admitted to the respective clinics. It is obvious that many more advanced and inoperable cases are admitted to the radiologic departments than to the surgical divisions. Hence the percentages of absolute cures in these clinics must be low.

TABLE IV
FIVE-YEAR END-RESULTS WITH VARIOUS METHODS OF TREATMENT

CLINICIAN	OPERABILITY PER CENT	TOTAL NUMBER	TOTAL NO. LIVING	RELATIVE CURES	ABSOLUTE CURES	METHOD OF TREATMENT
Clark, J. G.	17.0	140	12	27.2	8.6	Radium
Bailey and Healy	28.2	165	23	34.1	13.9	Radium
Kehrer	45.7	129	36	40.7	27.8	Radium
Ward and Farrar	23.6	72	17	52.94	23.6	Radium
Heyman	16.6	217	44	40.5	20.3	Radium
Doederlein	32.6	755	103	30.3	13.2	Radium and x-rays
Baisch	51.0	198	28	23.8	14.1	Radium and x-rays
Schmitz	16.94	183	26	48.4	14.2	Radium and x-rays
Martzlaff	52.1	387	102	46.5	26.6	Surgery
Stoeckel	70.6	350	98	35.4	26.6	Surgery
Graves	64.0	181	34	34.2	18.5	Surgery

THE HISTOPATHOLOGIC CHARACTER OF CERVICAL CARCINOMAS IN RELATION
TO THE PROGNOSIS OF TREATMENT

The observation may be frequently made that a primary cancer of clinical Groups 1 and 2 did not respond to treatment, though a relatively good prognosis was justifiably rendered. The patient either succumbed to the progressive growth or to a recurrence appearing within a short time after treatment, either surgical or radiologic. Undoubtedly carcinomas occur which show marked degrees of pleomorphism or undifferentiation. They are so highly malignant that the indicated treatment is powerless. The histologic malignancy of the growth is one factor in such hopeless cases; the extent of the growth is another; and loss of avidity of the carrier, that is, total absence of carcinolytic reactive powers in the serum of the host, is probably a third reason. We are, however, concerned in this paragraph only with the histopathologic aspects of carcinomas. It has already been shown that clinical Group 4 cases give an absolutely bad prognosis.

A study of the morphology of cervical carcinomas has been made by Schottlaender and Kermauner,⁶ Alter,⁷ Martzlaff⁸ and others.

Martzfloß reports a better end-result of treatment in spinous-celled carcinomas, namely, 47 per cent; in the round-celled types, 24 per cent, and in the spindle-celled types, 9.5 per cent. Greenough⁹ found a very definite relationship between the degree of malignancy and the prognosis of breast carcinomas. Four classes of malignancies were distinguished from low to high according to the degree of anaplasia as expressed in the irregularity in size and shape of cells and nuclei, hyperchromatism, functional activity, and mitoses. The results of treatment in each class were:

GREENOUGH'S RESULTS

CLASS	PATHOLOGY	NUMBER OF CASES	NUMBER OF CURES	PER CENT OF CURES
1	Much differentiation	6	4	66.67
2	Moderate differentiation	19	9	47.37
3	Slight differentiation	43	10	23.26
4	Highly malignant	22	0	0

Broders¹⁰ has shown a very definite connection between the cellular differentiation and undifferentiation of carcinomas and the good clinical end-results obtained after treatment. He recognized four grades of carcinomas.

BRODERS' RESULTS

GRADE	PATHOLOGY		PER CENT GOOD END-RESULTS		
			NO. OF CASES	PER CENT	END-RESULTS
1	Differentiation	100 to 75 per cent	82	9.31	90.20
	Undifferentiation	0 to 25 per cent			
2	Differentiation	75 to 50 per cent	407	46.25	66.16
	Undifferentiation	25 to 50 per cent			
3	Differentiation	50 to 25 per cent	282	32.04	24.82
	Undifferentiation	50 to 75 per cent			
4	Differentiation	25 to 0 per cent	109	12.38	10.09
	Undifferentiation	75 to 100 per cent			

Hueper and I¹¹ studied the pathology of 139 cases of cervical carcinoma. The factors used in the study of anaplasia comprised the cell type, the irregularities in size and shape of cells and nuclei, distinctness and clearness of cell wall, functional activity of cells, hyperchromatism and prophase, and mitoses. A numerical malignancy value was given to each one of the factors. The sum of these values was termed by Hueper the "Histologic Malignancy Index." The lowest index attainable is 10, the highest 40. The cases were divided into four groups, namely, malignancy index 10 to 20; malignancy index 21 to 25; malignancy index 26 to 30; and malignancy index 31 to 40. The end-results were known in fifty cases. The clinical Group 4 cases numbered eight and, being hopeless, were omitted.

A rise in the malignancy index causes a decrease in the percentage of good end-results. The same observation was made in the series of

SCHMITZ' RESULTS

GROUP	PATHOLOGY		NO. OF CASES	NO. OF GOOD END-RESULTS	PER CENT GOOD END-RESULTS
1	Malignancy index	10 to 20	13	10	76.97
	Average	15.67			
2	Malignancy index	21 to 25	14	6	42.86
	Average	23.17			
3	Malignancy index	26 to 30	11	3	27.27
	Average	26.41			
4	Malignancy index	31 to 40	4	0	0
	Average	33.33			

Group 1 Group 2 Group 3 Group 4
 M.I. 10-20 M.I. 21-25 M.I. 26-30 M.I. 31-40

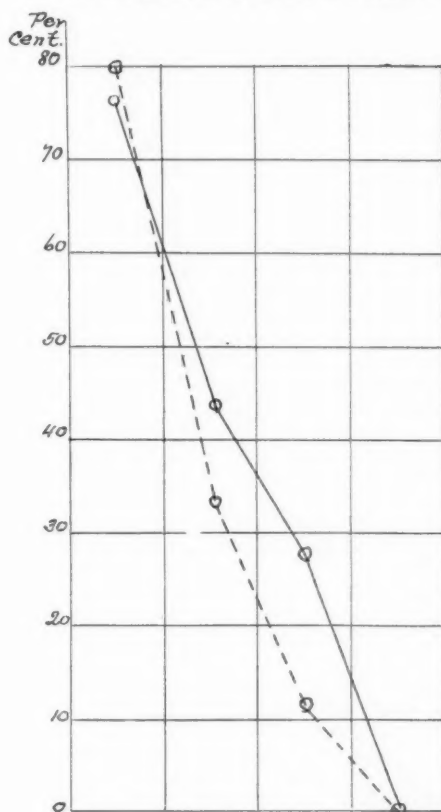


Fig. 2. Graphs of Histological Malignancy Index and Five Year End Results.

———— Malignancy Index
 - - - - - Five Year End Results.

five-year end-results classified according to the clinical groups. As the local extent of the carcinoma increased so the number of five-year healings decreased. An investigation is now being conducted to determine whether the degree of histologic malignancy index is depend-

ent on the duration of the disease, that is, whether the index increases in height with the increase in the duration of the disease.

DISCUSSION

The interpretation of the prognostic value of the malignancy indices and of the clinical grouping of the carcinomas according to their clinical extent may be facilitated by projecting the percentages graphically. The abscissae represent the percentages and the ordinates the clinical groups and the malignancy index. (See Fig. 2.) The graphs of the five-year end-results and the malignancy index are almost

Broders' Grade1 Grade2 Grade3 Grade4
Greenough's Class1 Class2 Class3 Class4
Schmitz' MI10-20 MI21-25 MI26-30 MI31-40

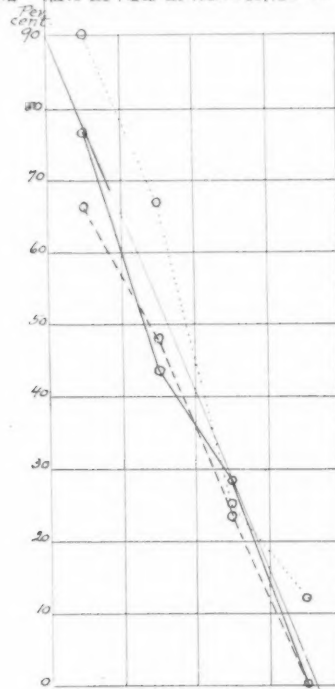


Fig. 3. Graphs of Good End Results determined from Degree of Anaplasia.

..... Broders' Results. ----- Greenough's Results.
———— Schmitz' Results. Straight Line = Malignancy Line.

parallel. Two facts stand out clearly: (1) The clinical Group 4 cases characterized by fixation of tissue and regional lymph-node involvement give an absolutely bad prognosis. (2) Carcinomas having a malignancy index above 31 corresponding to Broders' Grade 4 and Greenough's Class 4 offer the "worst" prognosis. A malignancy index above 31 is shown to be 100 per cent within the "worst" progn-

sis. The clinician may have to consider these two facts in the prognosis and treatment of carcinomas.

The results reported by Broders, Greenough, and me also, may be plotted as seen in Fig. 3. Differences between Greenough's and my results are negligible. The better results of Broders may be due to the fact that a much larger number of cancers formed the basis of his findings. All agree that high malignancy is shown by cells and nuclei of irregular shape and size, without secretory function, and arranged in solid columns, large or small, together with numerous and irregular mitoses and hyperchromatism. The degree of malignancy of a carcinoma can be determined with a reasonable accuracy by study of the histology of the tumor.

An average of the three percentages in each grade may be taken. For Grade 1 it would be 77 and for Grade 4 it would be 3.4. A line drawn through these points strikes the percentage 53 in Grade 2, and 29 in Grade 3. These percentages coincide with those of the averages in each grade. This straight line, therefore, may be termed the "malignancy graph." The graph represents the probable range of averages of good end-results in each grade or group. In Grade 1 the percentage of good end-results may vary from 90 to almost 67 per cent; in Grade 2 from 67 per cent to 42 per cent; in Grade 3 from 42 to 12 per cent; and in Grade 4 from 12 per cent to 0. The good results of treatment reported by Broders, Greenough and myself are contained within these limits.

CONCLUSIONS

1. Cervical erosions and hyperplasias resulting from infections, inflammations or traumas should probably be considered as some of the potentially predisposing causes of cancer. A surgical correction of lacerations of the cervix and perineum in recent traumas, and an amputation of the cervix with erosions or hyperplasias of long standing, are deemed advisable. A definite relationship between carcinoma of the cervix and the number of labors could not be established. Numerous births apparently do not increase the liability to cancer. On the other hand injury of the cervix from birth trauma resulting in chronic proliferative changes may be considered as predisposing factors of cancer.

2. The indications for the treatment of cervical carcinoma should be based on the clinical grouping. The grouping is determined solely from the extent of the growth. Group 4 cases are characterized by fixation of tissues and offer an absolutely hopeless prognosis.

3. The determination of the degree of histologic malignancy enables a physician to render a relative prognosis in the treatment of cervical carcinoma. A high degree of anaplasia is always associated with a bad prognosis, while a high degree of differentiation usually means

a good prognosis of treatment unless a case should belong to clinical Group 4. The clinician will probably have to consider the histologic malignancy index in selecting the method of treatment.

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22 EAST WASHINGTON STREET.

(For discussion, see p. 685.)

A GYNECOLOGIST LOOKS AT PROSTITUTION ABROAD

WITH REFERENCE TO ELECTROCAUTERY TREATMENT OF GONORRHEAL
CERVICITIS AND URETHRITIS*

BY ROBERT L. DICKINSON, M.D., F.A.C.S., NEW YORK, N. Y.

IN THE world-wide contest with disease one finds spectacular retreat on every field except three. The first of these, cancer, can, however, claim able organization and educational campaigns for early diagnosis and operation, for long research and for the study of irradiation. As to the combat against the second, the most common disease transmitted by prostitution, the group of men which has taken least part is that group which is most concerned. The gynecologists are the men most concerned because their patients pay the great penalties of gonorrhea in sterility, invalidism, obstinate infections and mutilating operations. We have been too busy digging into and perfecting the technic of what constitutes nearly one-fourth of major surgery to consider prevention.

As to the third stalemate which is the chief of all medical failures, the mortality and morbidity of childbed, our national medical societies fight government help. Thus it happens that in our specialty there are found the two universal diseases which are not yielding to modern sanitary progress and which are not subjected to wholehearted marshalling of the opposing forces.

Furthermore, while one is grouching, it would be in tune to draw attention to the way we hold aloof in our college courses and societies and journals from the chief field for preventive gynecology, sex education in the medical sense, covering such items as premarital

*Report from the Committee on Maternal Health, New York, read before the American Gynecological Society, May 24, 1927.

examination, the office confessional with admonition, or birth control instruction where properly due. Indeed, whenever we decline to take any official part in world problems which fall directly within the scope and practice of our specialty (like sterilization and birth control), it is with a poor grace that we refuse help or guidance to the lay organizations that try to make up for our neglect.

In the fifty years of the life of this society of specialists on diseases of women, and among its fifteen hundred published papers, this is the first time that the word "prostitution" has dared to show itself in a title. Furthermore, the organization that had Noeggerath for a member has not had the word *gonorrhea* among its captions as often as once in two hundred papers.

DISCOURAGEMENT ABOUT CURE OF GONORRHEA

In a visit to fourteen countries made last year by the Secretary of the Committee on Maternal Health there was encountered a general expression of opinion that the present methods of diagnosis and treatment of syphilis give the strongest hopes for steady recession and, in the more civilized and controlled parts of the world, for eventual conquest of the disease. This was in strong contrast to the feeling about gonorrhea. "The more obstinate forms of infection of the cervix," several men of large experience said, "are incurable." The inscribed and arrested prostitutes were found to be in the hands of able specialists in dermatology-syphilis in the large cities that were visited but their prominent gynecologists seemed to take no part in the troublesome problem. As an important side issue bearing on our Committee study of sterility it was therefore deemed advisable to inspect the technical methods of diagnosis and treatment.

If one had no qualifications for gauging the effectiveness of diagnostic methods, at least one could make an attempt to determine whether there might not be some items of our treatment worthy of trial. This aspect of the treatment question abroad is of an importance not to be exaggerated. In this country when a patient has received sufficient benefit to alleviate or remove the symptoms, or when she is discouraged, she disappears. There is little chance of getting her to return several times, even with a follow-up letter or call, for tests needed to make sure that contagiousness has disappeared, the only exception being in anticipation of marriage. But in the municipal clinics to which the police refer prostitutes the arm of the law reaches out and brings back the delinquent who disregards a written notice. And she is obliged to come any number of times.

Action is desirable at this particular time because abrogation of reglementation and inscription is proceeding so rapidly that enforced return may not be available in a few years to help us to study end-results of various treatments.

There is the greater need of certainty of cure because our diagnosis of persistence of infectiousness or freedom from risk has many loop holes. In the detailed studies of Bettman or Haustein the difficulties of diagnosis are not boggled. Except in acute conditions or marked cases, dependence on single microscopic tests or cultures is illusive. Even with the expertness of the best men like Neisser and Buettner one finds in 1308 examinations of prostitutes, in police work, only 23 per cent of positive diagnoses. The more careful study in hospitals by Bergh, Lappe, Schultz, or our own Pryor, found, in 5816 cases, 51 per cent of undoubted gonorrheal infections. Lochte detected, in cases that clinically presented no suspicious evidence, 16 per cent gonococci in single examinations, but 34 per cent when three to four tests were made. Palmer Findley had an opportunity during the World War to segregate women arrested in the vicinity of army camps and to keep them under observation two or three months. With 30 per cent positive at the first examination, 92 per cent were positive with tests carried ten days. Curtis (1919) doubts such extensive success in finding the gonococcus. While practically all leucorheas in women who have not borne children are called by him the result of this kind of infection, the gonococcus has disappeared in most instances when the patients appear. Bettmann (p. 115) shows how infectiousness may show up on one day and be absent on another. He demonstrates how often women infect their clients notwithstanding repeated negative findings. The difficulties are increased owing to the means taken by the professional before examination in the way of douches, massage of the urethra and even treatment by a doctor.

Secretion from the vulvovaginal glands is not easy to secure. From the urethra the platinum loop or blunt spatula is the preferred method. The urethral glands present considerable difficulties in diagnosis. Bergh found 151 infected urethras in 672 public prostitutes and 556 in 2558 clandestine prostitutes and proved the rebellious character of diseases in this concealed area.

In the cervix clear mucus often harbors rich bacterial flora. Here again the spatula or the loop or aspiration secures the specimen. It may be said that standard examinations average twenty minutes, from forty-five minutes to two hours being the outside limits. Jadassohn asserts that a doctor can, with the assistance of a technician of sufficient experience, bring the tests down to six or eight minutes. Baermann in fourteen days tested 393 prostitutes for gonococcus, using in each case two preparations from the cervix and two from the urethra, one with methyl blue stain and the other by the Gram test. The control of about 35 prostitutes, in daily sessions of one and a half hours, was undertaken, the microscopic search of 140 preparations taking five hours. The urethral secretion takes first place in importance. Baermann, for instance, found in the vagina, 5 per cent of gonococci; in

the vulvovaginal glands, 11 per cent; in the rectum, 8 per cent; in the urethra, 70 per cent, and in the cervix, 45 per cent, in groups of prostitutes.

The Continental statistics concerning prevalence and comparative frequency of location have been well presented by Bettmann (pp. 97 to 136) and Menge. The most satisfactory and substantial treatise in English on gonorrhea is the large volume of Norris with its full bibliography. While stressing the value of clinical findings, he fails adequately to picture the appearances viewed in office examinations of the cervix and urethral glands. My later detailed report will do this, particularly with regard to the urethral glands and the varieties of chronic cervix inflammations, as I have made a life size sketch of the region in most cases, and in many a diagram for each visit.

The attack on gonorrhea should be more readily made effective by systematic removal of infections in the female than by centering chief attention on the male, because there are from one-fifth to one-third of the number of infections found in the former. The canvass of every doctor's office in Detroit in a given day in May, 1926, by representatives of the American Social Hygiene Association, showed three times as many males as females asking treatment for gonorrhea. The figures were taken to mean that within the year one Detroit woman in 50 had symptoms enough to call for care. From the same source we learn that in the other city (Atlanta), completely surveyed for the year 1926, gonorrhea was reported to the Board of Health twice as often as syphilis. One in ten of the inhabitants applied annually for treatment for venereal disease. The incidence among males agreed with that of Berlin for 1900. The study by the Public Health service and the Association is covering seventeen cities and counties this year.

With gonorrhea an underestimate of prevalence is always likely because of the number of mild cases and the frequency of self-treatment. In women an active infectiousness is compatible with no more bother than a mild leucorrhea and a moderate irritability of the bladder.

Flexner in his study of prostitution says we have no state where a statute against prostitution is enforced; that no American community can be induced to penalize voluntary immoral relations, even though the women regularly earn their livelihood in this way. Yet he shows that commercial exploitation and red light districts, disorderly houses and street walking can be suppressed by any city administrator and that such action will be sustained by public opinion. He is convinced, after his survey abroad and here, that making prostitution clandestine is a gain. He outlines a constructive program. Lessening the incentives to lust, diminishing the number of defectives, combating alcohol, ignorance and bad and broken homes, must be combined with provision of innocent, healthful, alluring recreation by the community.

Flexner's remedies are basic but long to apply. Our own responsibilities may touch only one part of the evil, but the assistance we can give may be put to work at once by lessening the number of foci of infection.

The men treating gonorrhea in prostitutes feel most discouraged about the cervix. The general report in the literature is that the gonococcus is more often detected in the urethra than in the cervix, but it seems to be thought more accessible and amenable in the former location. Menge found it present in the cervix in 95 per cent of all chronic gonorrheas in women. The branched, cervical glands with their narrow openings present peculiarly unfavorable conditions for applications to reach the ramifications of these pockets, as Norris (p. 98) shows. This is a strong argument for the sterilizing preparation of heat.

THE HEAVY CAUTERY TREATMENT

In summarizing the claims for the cautery for rebellious infection of the cervix and meatus (for in this year the cautery treatment comes of age) the one point besides its high percentage of cures on which stress should be laid and in which it challenges comparison with every other method, is the infrequency with which it needs to be applied. Nearly all other methods, such as diathermy, Bier suction, injection of mercurochrome or alcohol, and silver preparations, call for repetition every two to four days for several weeks or months. The cautery is used one to three times at intervals of one to three weeks.

Dr. Guy L. Hunner of Johns Hopkins devised the method. His original statement covers so many important points that his technique should be quoted in full.

"During my early association with Dr. Kelly we often treated cases of cervical gland hypertrophy by making multiple radial incisions within the external os by means of a scalpel. This opened many of the dilated cervical glands, or Nabothian follicles, and allowed their mucous contents to gush out. I often noticed, however, that after recovery of such patients from their principal operation the cervical condition did not seem to be altered. Later it was our custom to take the hot blade of a Paquelin cautery and run it about over the hypertrophied mucosa of the cervix. This destroyed the superficial layers of tissue, causing a temporary necrosis. But as soon as the surface epithelium was replaced the leucorrhoea seemed to be as profuse as ever. My method grew out of these two, and consists in radial incisions deep into the cervical tissues by means of the cautery blade. I believe the other two methods failed because the incisions with the knife-blade simply emptied and failed to destroy the dilated cervical glands, while the surface application of the cautery failed either to empty or to destroy the deeper glands. The deep radial cuts with the cautery empty the deep cervical glands and cause such a wide necrosis of tissue that many of these deep glands are obliterated in the healing process.

One great advantage of this method is that it may be applied in office practice without giving anesthesia of any kind. With the patient in the dorsal or lithotomy position, a broad-bladed Sims' speculum is introduced into the vagina, the anterior

lip of the cervix is firmly grasped with a tenaculum forceps, and the cervix is pulled down as near the vulvar orifice as possible. The nurse or assistant stands by with the cautery already heated. On transferring the cautery to the operator the nurse continues to work the cautery bulb with one hand, while she retracts the Sims speculum with the other. The operator retains the tenaculum in one hand and manages the cautery with the other. The strokes should be made one at a time, the cautery being removed from the vagina after each stroke as the patient feels the radiated heat on the vaginal walls. The patient is warned that she will feel the heat but that she must not move, as there will be no actual pain.

The number and depth of the radial strokes depend largely on the condition of the cervix, but in general I make five or six strokes at each treatment and burn to a depth of 2 to 5 mm., or, roughly, from one-eighth to three-sixteenths of an inch. The length of the stroke naturally varies with the conditions present, but it should extend over the area of the hypertrophied cervical mucosa, which generally covers all of the mucosa in sight. The treatments are given once in three weeks. A sterile strip of gauze is left in the vagina to take care of possible hemorrhage. The patient is instructed to withdraw this the next evening, and she is warned that the leucorrheal discharge during the first week or ten days will be more profuse than ever and that she may have some slight bleeding. She is instructed to go to bed and remain there if the bleeding is at all profuse. I have not known hemorrhage to take place the day of treatment, but there is often a little hemorrhage after three or four days when the necrosis of tissue is at its height, and in one or two instances this hemorrhage has been sharp enough to alarm the patient. A daily douche is recommended during the interval between treatments. I have had three treatments produce such a beneficial effect in a marked case of leucorrhea that the patient considered herself cured and did not come for further treatment. The usual number of treatments ranges from three to six, and the greatest number of treatments I have given any patient is ten. I operated on this patient in August, 1903, during an acute attack of gonorrheal peritonitis, and did a supravaginal amputation of a myomatous uterus, associated with gonorrheal pus tubes. After recovery from the operation she continued to have a profuse leucorrheal discharge from a lacerated and hypertrophied cervix. After ten cautery treatments the cervical mucosa was devoid of any evidence of inflammation and there was no leucorrheal discharge.

I have found the chronic gonorrheal cases the most obstinate ones to treat, it being necessary to destroy all of the deep cervical glands before the leucorrhea ceases. Another important consideration in these gonorrheal cases is that you may be able to reduce greatly the leucorrhea without stopping it entirely. In other words, the cervical catarrh may cease under the cautery treatment, but the leucorrhea may continue more or less profuse because of the endometritis and the metritis which are occasional sequelae in an ascending gonorrheal infection. But many gonorrheal infections do not gain a foothold higher than the cervix, and some which do go higher are taken care of by nature and leave no permanent lesions beyond the cervix. These cases may be classed as curable by the cautery method.

The quickest and most brilliant results are obtained in the cases of cervical hypertrophy and eversion of the mucosa due to multiple childbirth."

Hunner still employs the thick Paquelin blade to the exclusion of the electric cautery.

Cashman (1924) says that chronic cervicitis, except in superficial infections, is only curable by eradication or destruction of the deep glands; that cauterization is the simplest procedure, and such cure is the most potent prophylaxis against cancer. "The conversion of a

moderately lacerated cervix and profuse mucopurulent discharge into a normal looking cervix, resembling the nulliparous, with no discharge, is really remarkable." For five years he has employed the Downes electrocautery knife, burning the lining of the entire cervical canal at one sitting to a depth of one-eighth inch, and below the external os using six or eight radial incisions about one-fourth inch deep, the treatment being given in the hospital. Skene's glands are also cauterized and Bartholin's excised if necessary. The slough separates in seven to ten days, oozing being no more than at a period. Four weeks after operation the canal is dilated in the office, *thereafter weekly four or five times to prevent the stenosis otherwise not infrequent.* It will be seen that hospitalization and regular dilatation are involved in this adaptation of the Hunner procedure in comparison with the simple office technic when using a nasal cautery.

THE FINE WIRE CAUTERY

In 1906, having read Hunner's paper, I began to use and to teach the use of a simple and effective modification. Ready to hand was the outfit used in the nose, completely adapted for the cervix and urethra. The method was published with pictures in 1904 and 1911 for the meatus, and 1921 for the cervix.

The tip most often used is the simple narrow loop of platinum wire one cm. long or the spiral of about one-half that length. The former lays stripes along the raw areas of the inside of the cervical canal or punctures cysts. The spiral works fairly well up in the canal. A porcelain core inside the spiral,* while it is a little clumsier than the open spiral, has the advantage that a burnt core of mucus cannot clog the interstices of the platinum wire. The slender shaft or shank without crevices is made by Mueller of Chicago. None of the handles are perfectly satisfactory, but the Mueller has the broadest contact. The current is controlled by one of the outfits used for the toy trains of children at much less cost than those provided by instrument dealers, but this is said not to be free from danger of shock. With the direct current the whole outfit purchased from instrument houses runs up to \$35 for the alternating current, and for the direct current \$55 to \$85. That form of generator which makes a vicious spitting noise and may be used with any current is prone to alarm patients, but it is handy in being portable for work outside the office. Even the hum of the ordinary motor used with the direct current is objectionable. This should be silenced by hanging the motor in another room or in a closet or, better still, in the cellar. The switch with which it is started, however, is to be located close to the gynecologist's seat. A cherry red heat is as effective as a white wire and does not cause bleeding. On

*Made for me by Agema, of Berlin.

granular areas a tiny gutter is quickly burned at three-eighths inch (one centimeter) intervals. For small areas punctures are made. Two to three weeks later intermediate areas may be attacked if any are still granular. Before treatment the surface should be painstakingly wiped dry. When the catarrhal secretion in the canal is adhesive, strong alkaline solutions have some effect, but the best mechanical method is a very narrow strip of rough gauze twisted into the canal to entangle the mucus. A piece of inch wide bandage carried in on a very narrow forceps works well. Suction may be tried.

The most obstinate form of gonorrheal endocervicitis is that which inhabits the canal high up, distends it with sticky mucus difficult to remove, and lines its cavity with a gristly surface which imparts to the tiny Dickinson curette, or to the sound or probe, a sensation resembling that produced by scratching the back of linoleum or Brussels carpet. Such a canal is carefully dried out. A single tenaculum steadies the external os if necessary, while a longitudinal application of the heat is made along the whole of one side from internal to external os. Then the opposite side of the passage is treated in the same manner. It is only in the canals almost large enough to admit the finger that more than two stripes need to be made at the first session. Two to three weeks later on the sides not touched identical stripes may be made if necessary, but it is surprising how often the double stripe suffices, and such initial reserve is supposed to be desirable for fear of undue narrowing of the channel. In twenty years I have yet to see a stenosis or need to use a dilator as a result of the cautery, and I have sent for a number of cases treated many years ago for aggravated infection in order to verify this statement. The stenosis reported by Cashman has been due to the wide slough produced by the broad Paquelin blade and to adhesions of granulating areas. This is not seen with the narrower stripe. A certain number of patients are sensitive and will need bleaching by adrenalin combined with the anesthesia produced by novocaine. The preliminary cleansing will determine sensitiveness and tell which cases call for local anesthesia.

The cystic cervix is especially adapted to cautery treatment. There are surfaces so deeply riddled with cysts that only amputation or Sturmdorf coning will relieve the pressure ache, but even these are worth trying to cure with the fire-needle for the reason that unexpected success has developed in cases apparently belonging exclusively to surgery. As one crop of surface cysts is sterilized and destroyed by heat, the deeper group come to the surface and the marked shrinkage of the whole cervix makes them accessible. At any given session every cyst that can be located should be punctured. In the depths of a large cyst the wire is moved about in order that complete obliteration may result. The sloughy opening insures against closure be-

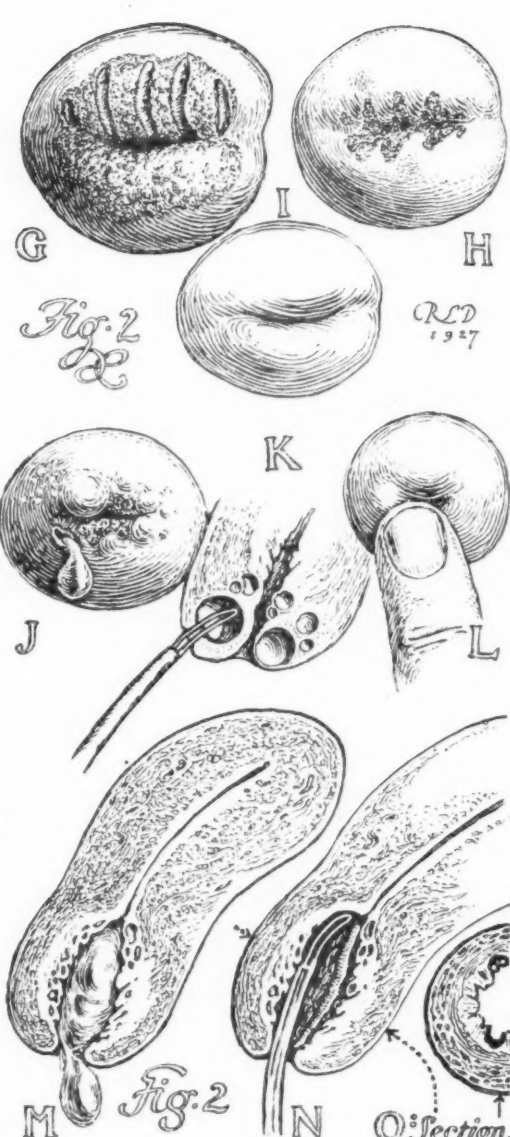
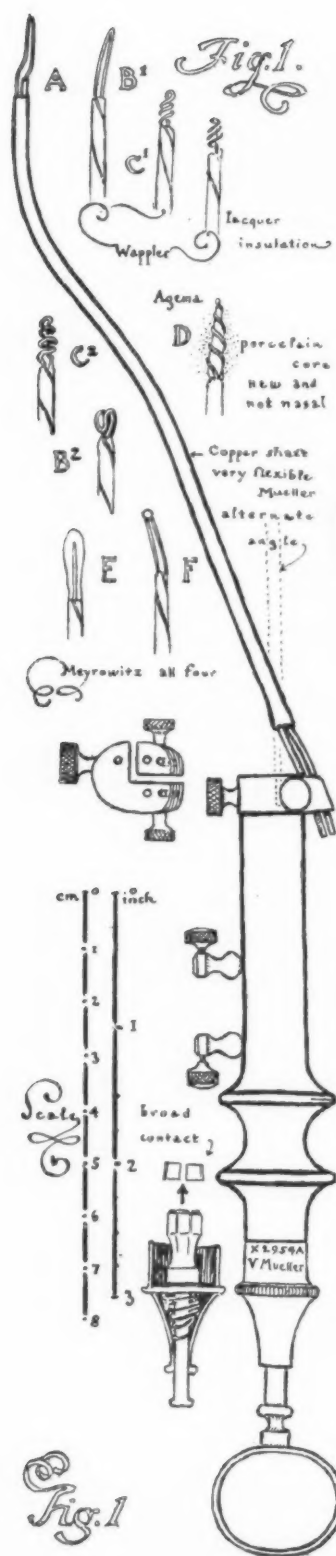


Fig. 1.—Cautery Handle and Nasal Electrodes. The narrow loop (A or B) suffices for striping and punctate treatment, for opening cysts and removing polyps; also for reaching to bottom of urethral glands to sterilize them, or to split them wide open. Spirals (C¹, C², and D) are of some value deep in the cervical canal, but, used too actively, might cause stricture. The porcelain cone (D) prevents clogging with burnt mucus. The thin blade (E) can be applied flat on lesser inflammations. In sterilization, (B² or F) may be used, in lieu of spirals, to produce stricture at cornu.

Fig. 2.—Cautery Treatment of Gonorrheal Cervicitis. (G) Granular parous cervix treated on anterior lip by parallel cauterizing stripes close together. The heat sterilizes intermediate areas, and these unburned regions prevent stricture; (H) remaining areas, calling for second or third cauterization; (I) healthy surface with everted lips rolled in sufficiently to preclude need for repair; (J) cystic disease, one cyst cauterized, with contents extruded; (K) section, with wire penetrating cyst;

fore healing as sometimes happens when the cutting spear is employed. Cysts which the finger feels and the eye cannot find may be made visible by finger tip pressure, quick withdrawal of the digit and a stab at the blanched spot which remains in sight just long enough to reach it with the point. Only for deep punctures need the wire be white hot in order to keep on penetrating, but in vascular and varicose cervixes the platinum should carry as little heat as possible, unless decongestion by bleeding is desired.

The character of relief afforded by opening cysts is witnessed by the return of patients, months or years later, with cysts in new locations. They come to the office requesting new puncture as they recognize aching from recurrence of tension.

It is to be noted that the radial cautery stripes sometimes produce longitudinally contracting scars that tend to inroll the cervix. This supplements the effect of lessened congestion and edema and the retreat of the columnar epithelium within the internal os.

There is one objection to this procedure besides the cost of the outfit and that is the roast meat smell of burning flesh. I have the window behind me slightly open in order to stick the platinum tip over the sill in case the wire is clogged with tissue or mucus and this is to be burned off. This does away with most of the stench. I usually treat any extensive granular areas on everted cervical lips at one session and the deeper canal at the next session, but both can be handled the first time. Failure to get prompt results within the canal is usually due to insufficient cleansing. The wire is clogged and cooled by masses of mucus, and a defective and deceptive amount of heat is employed.

No after treatment is necessary, but the patient must be warned of the possibility of an unpleasant or irritating discharge for a few days which may require douching or special cleansing.

Crossen (1922, 1925) believes that where there is decided laceration and extensive formation of cysts, resection is preferable to the cautery and says that the Hunner treatment must be repeated every ten days or two weeks, sometimes over a period of several months. This repeated cauterization and the length of time required "constitute a decided objection." "The subject of linear cauterization has been presented most helpfully by Dickinson. This usually disturbs the patient very little and can be carried out as ordinary office work. It presents the advantages of the more severe Hunner cautery treatment."

Gellhorn (1923) gives the Dickinson method at length, and says

(L) palpation of deep cyst; (M) obstinate disease, deep in canal. Mucus must be dried out exactly (and a very narrow external os stretched) in order to enable the cautery wire (N) to run two or three grooves down the cervical canal, from top to bottom through its rough gristly lining (O). In (N) one gutter is burned, and the second begun.

undue contraction of tender scars has not resulted in his own practice.

Curtis, after working nine years on leucorrhea, gives his cures as follows: with radium, two applications, 90 per cent; with cautery, 50 per cent; with Sturmdorf, 50 per cent.

In the following reports, unless the Paquelin is specified, the electric heated platinum wire is understood to have been employed.

Gibson (1923) after making a clear classification of cervix inflammation, says that the infected nonlacerated cervix is the type "in which the cautery treatment has its most brilliant success," the most common etiologic factor being, "of course, the gonococcus." "The congested lacerated cervix," he says, "can generally be saved from operation by support and cauterization. In the infected lacerated cervix, cautery punctures of cysts and linear cauterization to cause inversion and support will do wonders."

C. H. Davis (1925) reports on 106 patients treated with the cautery in the office and 31 under ether in the hospital. Every case was improved. Six weeks was the healing time and a third application was infrequently needed. "We rarely advise operation unless other conditions demand it."

Shutter (1925) burns out the urethral glands with the platinum wire for chronic gonorrhea and does this to the cervix also. For three years he has studied hospitalized prostitutes and has determined a decrease in the number of hospital days required when cautery is used. He has not resorted to the cautery where the tubes were involved or acute gonorrhea present or close to the period. There was only one recurrence among 18 cases followed up. Cervical stenosis or obstructive dysmenorrhea has not been seen in his 83 cases. He makes an important observation in stating that "in institutions it affords a means of rapidly sterilizing the secretion in the irresponsible patient, regardless of the degree of her cooperation." "The gonococcus is destroyed in the tissues by the local elevation of temperature." In 1926 he reports on 350 cases.

Fulkerson (1926) labels the cautery standard treatment at the Cornell Clinic in his report on 591 cases, with 65 per cent cure, 90 per cent of clinical cure and one stenosis of the cervix.

Matthews (1926) reports on 226 cauteries in the office with 80 per cent of cures and 20 per cent improved, followed by many pregnancies and labors without complications due to the cautery treatment. He holds that with patients needing hospital operation, the Sturmdorf procedure is better than the cautery.

Polak (1927) says that his histologic studies show extension of the effect of heat 2 to 3 mm. beyond the slough. Matthews, in the same discussion, calls this distance 3 to 5 mm. Corbus (1927) shows that most of the bacteria, particularly the gonococcus, will be killed at this distance. McGlinn asserts that the cautery of Dickinson does not cure all gonorrheas but will, probably, cure the majority.

As to other methods of applying heat to these cervical surfaces, Abrams (1925) simply heats a forceps tip in the flame and applies it for 2 or 3 seconds to produce a slough. Tousey (1926) advocates electrodesiccation, but this involves the use of an electrode against the body from which a patient may occasionally pull away and also a noisy sputter of which she is afraid.

I have carefully compared fulguration with the simple incandescent wire. The five to ten times greater cost of the installation and the sputtering noise of the application are definite objections as well as the use of the external metal electrode. Furniss, who is very expert in fulguration and has also used the simple nasal cautery on cervix and meatus, is perhaps the most competent witness both as gynecologist and urologist. He has stated that fulguration has no advantages over the simple incandescent wire.

Thompson (1926) located cysts by transillumination with a Carroll antrum illuminator. When used outside the cervix it is hooded. A urethroscope may be used inside the cervix. The cysts show up as translucent areas.

Norris and Mikelberg (1923), studying 100 infants and young girls suffering from vulvovaginitis, report that all cases should be considered gonococcal unless proved otherwise, in view of their 60 per cent positive findings. "The cervix is infected in nearly all chronic cases. Failure to cure the infection in this area is the cause of the majority of recurrences. The infection rarely extends above the cervix."

A large part of their success is attributed to examination with a large Kelly cystoscope equipped with a cold lamp as routine. I draw attention to one weighty consideration. The use of the cautery in children abbreviates the treatment of this form of gonorrhea more than any one measure, since as a rule only one or two applications are required to wipe out the focus responsible for the trouble.

I have urged the importance of the cautery in the endocervicitis of the virgin (the actual virgin with the tiny hymen opening) because the treatment can be applied through a virgin speculum or a Kelly cystoscope and calls for only two or three visits. These conditions in virgins are seen in grown women after an infantile vulvovaginitis or in women whose hypertrophic vulvas (or admissions) show prolonged autoeroticism. In the latter case, it is particularly desirable that an abbreviated method of treatment should be employed.

CONCLUSIONS

1. Since gonorrhea has not yielded in any degree as have syphilis and most world scourges and infections, and since the cure is a matter of local treatment, gynecology should be actively concerned in a concerted attack on a malady which never confers immunity and which is accused of one-fifth of early blindness, most of the vulvitis of children, half the sterilities and half the pelvic disabilities of women.

2. Such attack should focus first on women because, as compared with conditions in men, the numbers to be dealt with are said to be less by two-thirds or four-fifths; the lesions are more accessible; the diagnosis is less difficult; prostitutes, open and clandestine, are largely of this sex; hospitalization is more practicable; and there is available for women a promising treatment involving minimum repetition or detention.

3. The direction for such attack is shown by the special circumstances surrounding this trouble. These are that the chief center is the big city; the chief characteristic is chronicity; the chief seat is the cervix; the chief cure is the cautery; the cardinal simplicity is this tiny platinum wire effective in office practice.

4. Follow-up, wherever enforceable, as among prostitutes, during the short period inscription is likely to last, should be pushed to the limit to study these cautery claims. Organization should be effected to hunt down every accessible focus.

5. Education of public opinion is, in part, a responsibility of medicine. We can help to define school instruction that will warn against the extent and duration of the penalties for exposure. Examination before marriage may have to become a custom before a law would be enforceable.

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THE SURGICAL TREATMENT OF IMPERFORATE ANUS, WITH THE REPORT OF A CASE

BY LEO P. BELL, M.D., WOODLAND, CALIF.

(From the Department of Surgery, Woodland Clinic, Woodland, California)

IMPERFORATE anus has been recognized since the seventh century. Paulus of Aegina first described a successful operation for its relief. A bistoury was passed through the perineum, the opening being later dilated by bougies. This type of procedure was practiced with very little variation until the time of Amussat. In 1835 he recommended proctoplasty with careful dissection of the parts and fixation of the rectum to the proper anal site. In 1844 the French advised inguinal colostomy when perineal section failed. Bell, of England, in 1787, was the first to adopt the rational procedure of dissecting through the perineum and searching for the rectal ampulla. The first successful operation in the United States was performed by Campbell in 1790.

Congenital defects of the anus and rectum, although quite rare, may be found in the professional practice of any physician or surgeon. According to statistics the ratio of occurrence is approximately one to ten thousand and, as a rule, it is more frequent in males than in females. The rate of occurrence, however, is probably higher, since many infants die with rectal imperfections and obstruction without the condition being recognized, or reported if recognized. The most frequent anal defects are malformations with abnormal opening, such as vaginal or urethral communications. The others are very rare. (Fig. 1.)

Bodenhamer, in 1860, wrote the first comprehensive chapter on the classification and treatment of the various abnormalities. In 1887 Cupps reported one hundred operative cases. Since that time numerous cases have been reported, both singly and in groups. The choice of operative procedure and end-results have varied markedly. The factors influencing these results are: the type of variation, physical condition of the patient, method of operation, and operative experience of the surgeon.

Owing to the rarity of these conditions, few surgeons are acquainted with the embryology of their formation or with the possibilities of variation.

A study of the factors involved will make it apparent that an imperforate anus may mean anything from the mere persistence of a cloacal membrane to a total lack of development of the rectal or the

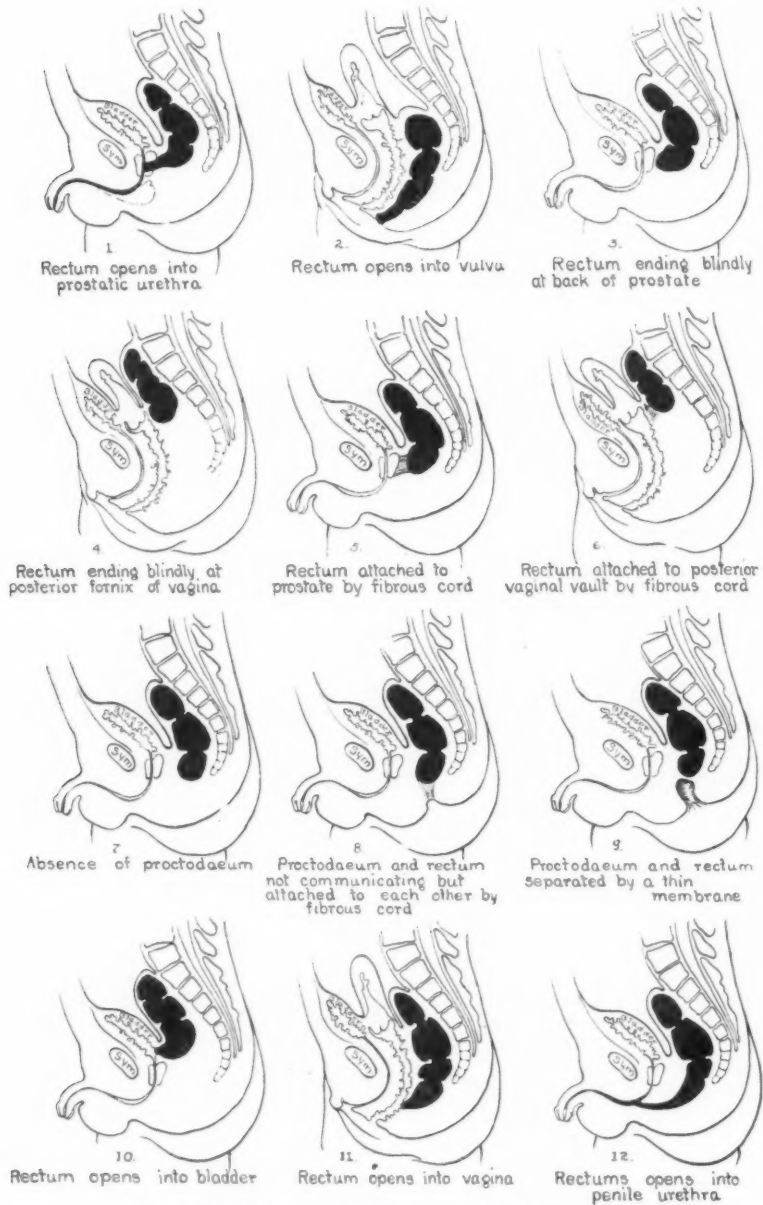


Fig. 1.—Possible variations of rectal abnormalities.

anal part of the canal. Moreover, the condition may be still further complicated by the presence of sinuses leading to the bladder, urethra, or genital passages. It will be readily seen that individual cases may present wide variations.

From the embryologic point of view all cases fall into one of the following three classes:

1. The hind gut is normal, but the canal is defective or absent.
2. The hind gut is imperfect in development and may or may not communicate with the genitourinary passages, but does not communicate with the anal canal, though the latter is normal.
3. Both the hind gut and the anal canal are defective.

The diagnosis is generally made through the discovery of the absence of bowel movements, vomiting and distention of the abdomen, straining at micturition, and voiding of fecal material when the rectum communicates with the urethra or bladder. When the rectum communicates with the vagina or when the lower extremity is narrowed

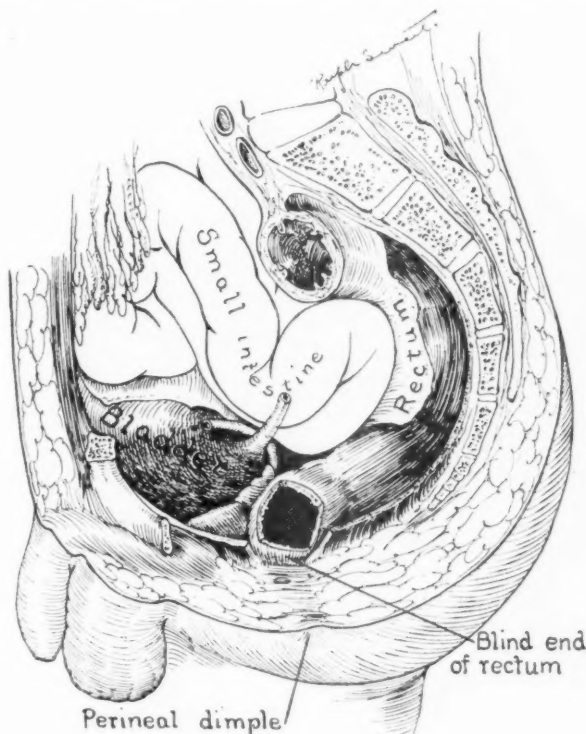


Fig. 2.—Position of the blind end of rectum before an attempt was made to pull it down into the perineum.

a careful examination may be made with a probe or child's cystoscope.

Too often the child comes under the notice of the surgeon in a very serious condition. Avoidance of delay in instituting operative intervention is imperative. The operative procedure varies with the abnormalities encountered.

The present accepted procedure is by the perineal approach, endeavoring to keep between the sphincter muscles. Light ether or local anesthetic is employed, with the child in extreme lithotomy

position, and a search of fifteen to twenty minutes is made for the blind end of the gut. If it is not discovered during this time, a left inguinal colostomy of the Mikulicz type should be done and the opening made immediately.

At a later date the rectum can be isolated and fixed in the perineum and the colostomy closed when the physical condition permits. It is

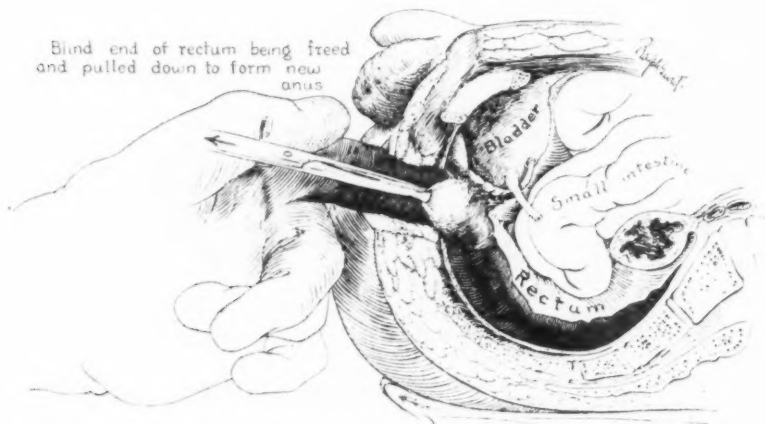


Fig. 3.—Blunt dissection of lower end of rectum preparatory to placing it in position between sphincter muscles in perineum.

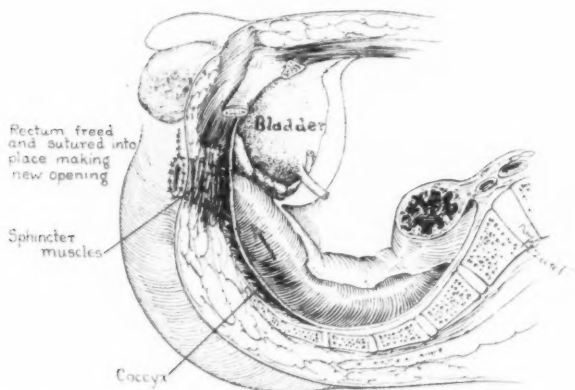


Fig. 4.—Relationship of the artificially made anus to prostate and base of bladder. Position in the perineum.

advisable to inject the lower end of the bowel with lipiodol to demonstrate all fistulas before closure of the colostomy and restoration of artificial anus is contemplated. Often after a colostomy has been established fistulas into the bladder and urethra may close spontaneously. All symptoms of fecal drainage are promptly relieved.

The mortality according to Cupps was 50 per cent. As reported by Brenner in 1915, it was approximately 25 per cent. Since the advent

of local anesthesia and the two-stage operations, it has been reduced still further.

It must be remembered that autopsy reports show many other deformities existing coincidentally, such as stricture of the esophagus, stricture of the pylorus, multiple strictures of the small and large bowel, absence of the large bowel, absence of one or both kidneys, and absence of gall bladder and common ducts.

Postmortem examinations should be sought on all operative deaths and explanations given to relatives of the variations which prevented

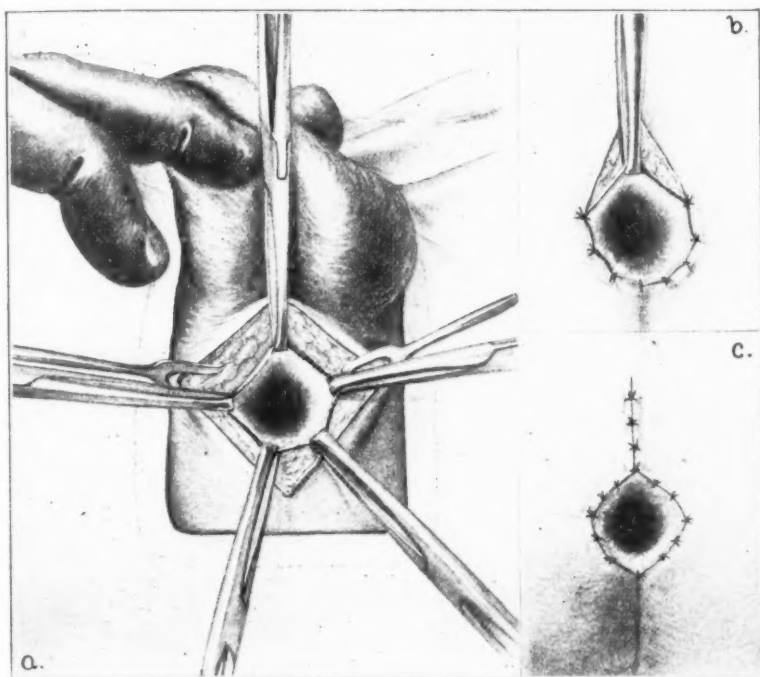


Fig. 5.—Approximation of the rectal mucosa to the skin edge. Interrupted dermal sutures used throughout.

a successful termination to convalescence following operative intervention.

The postoperative care is most important, since there is a tendency to stricture of the newly-formed rectum in most cases. This must be dealt with by frequent dilatation of the rectum, by bougie or finger, for a period of one year or more following operation.

The diet of the infant must be carefully watched since diarrhea, bronchitis, constipation, and malnutrition must be avoided. According to Keith many infants die following operation from malnutrition, constipation, and diarrhea.

SUMMARY OF CASE

Baby C., a white male, was operated upon April 20, 1926. There was no history of abnormalities in family of either father or mother. Baby was brought to the hospital approximately twenty-four hours after birth, the family physician having discovered that the rectum was absent.

Perineal approach was made in midline, attempting to keep in between sphincter muscles. The rectum was found to be one and one-half inches from the surface of the skin. By blunt dissection, the rectum was brought down, opened, and sutured to the skin surface as shown in the accompanying drawings.

The baby's convalescence was uneventful except that leakage of urine through the perineum was encountered the day following operation. Accordingly, about ten days after the first operation, a catheter was introduced through the urethra and followed down and guided past a fistulous point which was located in the membranous urethra. The catheter was kept in the urethra for about ten days. After its removal no leakage was discovered and convalescence has been without incident, the child voiding freely and defecating with apparent control.

It is assumed that the rectum communicated with the posterior urethra, or that an injury was done the urethra by needle puncture, since the sinus tract was very small. For this reason it is advisable to keep a catheter or sound in the urethra during the operation.

Since the operation, the child has been gaining in weight, but not so rapidly as a normal child. He has had several attacks of diarrhea and colds. Otherwise his progress has been entirely normal and his bowel movements are nearly normal at the present time. The child is now about eleven months old.

WOODLAND CLINIC.

Lenormant, C., and Hartman-Keppel, G.: Accidents of Tubal Pregnancy. *Gynécologie et Obstétrique*, 1923, vii, 273.

The authors add a new series of forty-eight cases to an older group reported in 1915. Each case is briefly reported. In the combined series of eighty-four cases with hemorrhages of various types there was a mortality of 10.7 per cent. Most of these cases reached the hospital in a grave condition. ADAIR.

Wislocki, G. B., and Guttmacher, A. F.: Spontaneous Peristalsis of the Excised Whole Uterus and Fallopian Tubes of the Sow, with Reference to the Ovulation Cycle. *Johns Hopkins Hospital Bulletin*, 1924, xxxv, 246.

The whole internal genitalia of the sow were observed in a bath of warm oxygenated Locke's solution. Spontaneous peristalsis and antiperistalsis were observed in both fallopian tubes and in the uterus. The muscular activity of the tubes and uterus shows cyclic variations coincident with the ovulation cycle. This activity suggests a possible mechanism for the transportation of ova. C. O. MALAND.

THE TREATMENT OF CONTRACTION RING DYSTOCIA WITH ADRENALIN*

BY M. PIERCE RUCKER, M.D., RICHMOND, VA.

WERE it customary to print facts in black and fancy in red ink, medical literature would be of a brighter hue, and I fear my present effort would be especially lurid. It is necessary, however, to have some sort of a framework for the fact one wishes to present, and the color of the frame is unimportant, if it does not distract from the fact. My difficulty is especially great in the present case, because I am presenting for a condition about which we know little, a remedy about which we know much that is contradictory.

That under certain circumstances a band-like contraction of the uterus forms and interferes with delivery, there is little doubt. Some authors prefer to call this Bandl's ring,¹ some add the word retraction, and some prefer the term contraction ring. The ring, called by whatever name you choose, is located between the lower, noncontractile portion and the upper contractile part of the uterus. In reference to the fetus, it is located either in front of the presenting part or else in front of some prominent fetal part. A favorite location is about the child's neck in head presentations.² The irregularities of the fetus thus fix the contraction ring, and the ring can neither ascend nor the lower uterine segment become distended or stretched. This makes a distinct difference clinically between the contraction ring that obstructs labor and the retraction ring that becomes so marked when there is obstruction to labor from extrinsic causes. Clifford White³ shows this well in tabular form.

Paul Harper,⁴ who has written more upon this subject than any other American, calls the ring a contraction ring when the upper uterine segment is not tonically contracted, and a retraction ring when the upper portion of the uterus has no period of relaxation. He speaks of both contraction and retraction rings as obstructing labor. It is hard to see how a contraction ring that obstructs labor can at the same time be a retraction ring and progressively retract, so long as it stays contracted.

The etiology of the condition is obscure. The great majority of cases are associated with early rupture of the membranes, but there are enough exceptions to show that this is not a fundamental factor. The same can be said of intrauterine manipulations and the use of oxytocics. Harper⁵ is of the opinion that the ring develops as the result of faulty innervation of the uterus or else an abnormal irrita-

*Read before the Junior Clinical Club, Richmond, Va., March 21, 1927.

bility of the uterus. He disposes of the former because he has seen cases of ring dystocia that showed no evidence of the condition in former or subsequent labors. In support of the latter idea, he says that the condition is very often found in neurotic individuals.

Treatment resolves itself into some form of operative delivery plus the overcoming or relaxing the contraction ring. Expectancy has no

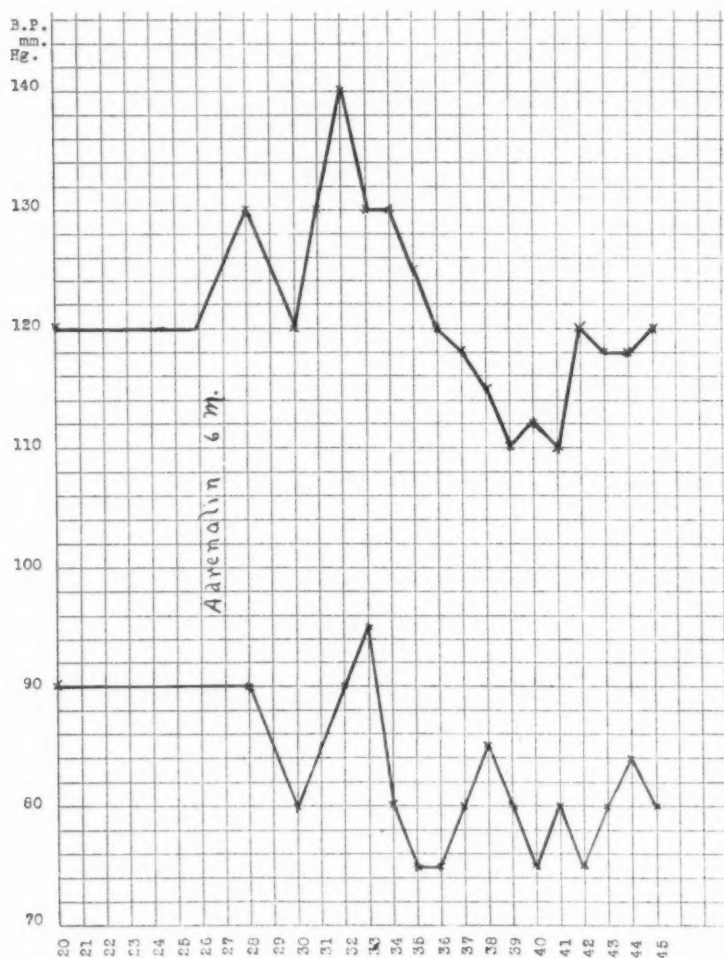


Fig. 1.—Blood pressure curve following the hypodermic injection of 0.5 c.c. of adrenalin in Case 2 one month after delivery. Each square vertically represents 2 mm. of Hg. pressure, and longitudinally one minute in time.

place in the treatment. White² cites Budin's case in which after thirty-six hours the ring was found to be as tight as it was at first. Various drugs, morphine, chloral, and hyoscyne have been tried in hopes of relaxing the ring and have failed. Amyl nitrite has been effectual in one reported case. Hot baths are said to have caused relaxation in one of Budin's cases. Attempts at forceful delivery with

forceps without first relaxing the ring have often resulted in rupture of the uterus. Willett⁷ recommends applying forceps and hanging a 6½ pound weight to them. Hicks⁸ cut off the head below the ring and delivered the body by internal version. Lochrane⁹ advises cesarean section after decapitation or craniotomy and decapitation in case of extreme pelvic contraction. White¹⁰ says that there is no satisfactory treatment except cesarean section, and even then it is often necessary to cut through the ring in order to deliver the child. Harper¹ on the other hand thinks that the ring can be relaxed with deep ether anesthesia, and then the delivery effected by appropriate means from below. Hicks¹¹ is of the opinion that once the ring is formed around the neck of the fetus it will grip it firmly until the patient is almost at the point of death.

My second difficulty, i.e., the contradictory views of the action of adrenalin upon uterine contractions is shown in Table I.¹²

TABLE I*

ANIMAL	NONPREGNANT UTERUS	PREGNANT UTERUS	INVESTIGATOR
Rat	—	—	Gunn and Gunn
Guinea pig	—	—	Gunn and Gunn
Guinea pig		— +	Sugimotol (intravenous +)
Guinea pig		— +	Flury (excised — <i>in situ</i> +)
Cat	—	+	Cushny Dale Kehr
Rabbit	+	+	Langley and Anderson
Ferret	+		Gunn and Gunn
Dog	+	+	Gunn and Gunn Kurdinowski
Monkey	+		Dale
Human (excised)		+	Gunn

*Inhibitor — Motor +

That the generally accepted view that adrenalin causes an increase in uterine contractions, is not true for the human intact uterus can be shown by hysterographic methods. In most cases a hypodermic injection of five minims of a 1/1000 solution of adrenalin causes a cessation of uterine contractions that can be shown graphically, and a relaxation of Bandl's ring that can be felt with the hand in the uterus. In no case have I obtained a motor effect. The cases in which there was no relaxation, showed no effect at all, and are probably to be explained by a vasoconstriction at the point of injection that delayed absorption. This observation of the effect of adrenalin upon the human uterus leads me to advocate its use to relax contraction rings in discussing Dr. Pride's¹³ paper at the Dallas meeting of the Southern Medical Association. Dr. Garber¹⁴ who was chairman of the obstetric section at the time, writes me that he has since used adrenalin in the presence of contraction rings that did not yield to morphine and deep anesthesia in eight cases and had a response in all but one. My own experience is limited to the two following cases.

CASE 1.—A 17 year old primipara, was seen in consultation at the Memorial Hospital March 8, 1926. Her pains began March 7 at 1 A.M. and the cervix was fully dilated in 11½ hours. For the next 20 hours she had severe pains but there was no further progress. Her pains were so severe that her physician had been giving her nitrous oxide-oxygen for several hours. At 8:30 A.M. (March 8) under ether anesthesia, he did an episiotomy and attempted to do a version. The amniotic sac was ruptured at 9:31 A.M. and a thick band was found tightly about the baby's neck. All attempts at delivery were stopped, but the anesthetic was continued. I saw the patient within ten minutes after this. During the time I was washing up the patient was completely relaxed with ether. Vaginal examination showed head in midpelvis in L.O.P. position. The flaccid cervix was loosely about the head. Around the neck there was a thick band that prevented my getting even a finger any higher in the birth canal. The anesthesia was continued as before and five minims of a 1-1000 solution of adrenalin were given hypodermically. Within a few minutes the contraction ring disappeared and I was able to do an easy version and extraction. The child was delivered at 10:06 A.M. and the afterbirth as soon as the episiotomy wound was repaired. The baby, a girl, weighed 3011 gm. and was 46 cm. long. Both mother and baby left the hospital in good condition. The mother had a temperature of 105° on the eleventh day and of 102° on the twelfth day. Otherwise the puerperium was normal. The baby was doing nicely on March 30, 1926.

CASE 2.—A 31 year old secundigravida came under my care December 17, 1926. Her last menses began on May first. Her pelvis was a little under normal, the diagonal conjugate being 12.5 cm. Her first child had been delivered with forceps. Otherwise her history and physical examination, including blood Wassermann, were negative. On February 3 the bag of waters ruptured, but the patient had no pain until 10 o'clock the next night. At 3:15 A.M. February 5 the cervix was found to be fully dilated, and the patient was having hard pains. The head was in L.O.A. position. She was given sacral analgesia. Forceps were applied and an unexpectedly difficult extraction was done. Two loops of cord were found tightly wrapped around the neck. When the cord was cut between clamps and unwrapped, I was greatly surprised to find that I was still unable to deliver the shoulders or even rotate the body. Traction on the head combined with pressure on the fundus was entirely ineffectual. The patient was conscious and cooperated well with her abdominal muscles, but even at the acme of the combined efforts of the patient, the nurse and the doctor, the head appeared to be drawn upward against the perineum. It now occurred to me that there might be a contraction ring. The patient was accordingly given five minims of 1-1000 solution of adrenalin. Extraction then was surprisingly easy. The baby, a still-born male, weighed 4024 gm. and measured 54 cm. in length. The placenta was expressed in five minutes to stop bleeding. The puerperium was uneventful and afebrile.

There now remains the fascinating exercise of attempting to explain this effect of adrenalin. Marshall¹⁵ in his *Physiology of Reproduction* states that there is a slight increase in the size of the adrenals and a slight increase in the load of adrenalin during pregnancy. Just what is the purpose of such a change is not stated. The uterus is capable of undergoing contraction even when separated entirely from the body and the experiments of Helms,¹⁶ Kurdinowski,¹⁷ Sir James Y. Simpson¹⁸ and others¹⁹ upon animals and the clinical observations upon patients with spinal cord injuries²⁰ would indicate that the uterus is capable of expelling its contents up to the end of the first stage of

labor independently of the nervous system. Under ordinary circumstances, however, it is under control of the automatic nervous system.

The involuntary nervous system, be it remembered, is divided into two parts, the sympathetic and the parasympathetic or bulbosacral.

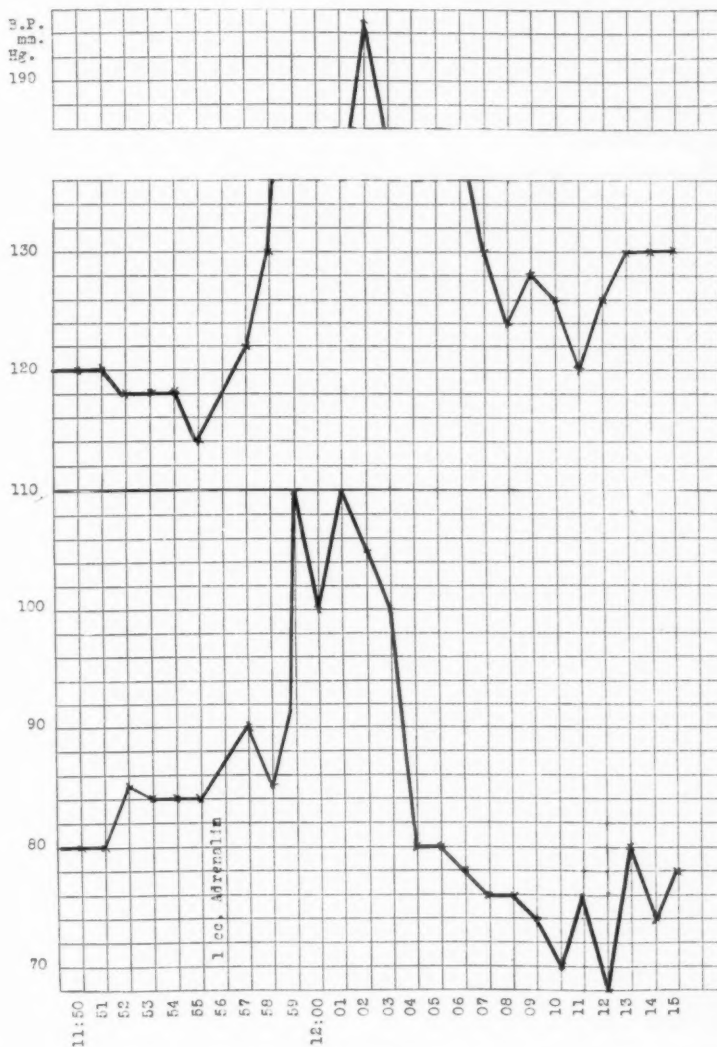


Fig. 2.—A typical sympathicotonic reaction to 1 c.c. of adrenalin, obtained the first day postpartum. This patient had postpartum hemorrhages after her two previous deliveries, and after this delivery the flow was much freer than in the average case.

Where these two systems enervate the same organ their actions are sharply contrasted.²¹ The pupillary reactions and the heart rate are well-known examples of such antagonistic action. Stimulation of the cervical sympathetic causes a dilation of the pupil, whereas stimula-

tion of the oculomotor fibers causes a contraction. A stimulation of the cardiac nerves (sympathetic) causes acceleration of the heart and stimulation of the vagus (parasympathetic) a slowing or even stoppage of the heart. Unfortunately the action of these two systems upon the uterus has not been worked out. There is some pharmacologic evidence that the sympathetic system is an uterine inhibitor. In a recent work upon the action of ergotamine, Vazeille²² has shown that it has a direct inhibitory action upon the sympathetic. The action of adrenalin is considered to be identical to that of stimulation of the sympathetic except that it is slower and more prolonged. Cannon²³ says that disturbances in the realm of the sympathetic, although initiated by nervous discharge, are automatically augmented and prolonged through chemical effects of the adrenal secretion.

Vignes²⁴ in discussing the variations in the action of anesthetics has long stressed the clinical differences in uteri. In his recent *L'Année Obstétricale*²⁵ he reviews the work of Peyser, Vowinkel, Seitz and Louros who show that during pregnancy there is an abnormal excitability of automatic nervous systems, sometimes showing as a vagotonia and sometimes as a sympathicotonia. This is shown clinically by the palpitations, respiratory arrhythmias, digestive disturbances, dermatographias and action of the sudorific glands of the skin. It can also be shown by the differences in response to the hypodermic injection of adrenalin as shown by the blood pressure curve. Three types of response are described. In a normal subject the elevation in arterial tension and subsequent fall describes a parabola. With the sympathicotonic the pressure describes a steeple-like curve. With the vagotonics the pressure ascends as in the normal patient and the descent is also similar but the descent continues below the base line and there is a secondary rise to the initial level. In other words there is a second parabola below the base line. In applying the adrenalin test hypodermically one must remember that sometimes the local vasoconstriction and the consequent slow absorption of the adrenalin may entirely vitiate the test. In such case, these investigators have used intravenous injection although they recognize that such a procedure is not entirely free from danger. In pregnant women Louros has never seen a normal response to adrenalin and Peyser seldom obtained a normal response. In this connection it is interesting to note that my last patient showed a vagotonic response to adrenalin in her puerperium.

In the light of this work may it not be that the contraction ring, which Harper thinks is due to an abnormal irritability of the uterus, is the expression of an abnormal sensitiveness of the parasympathetic system. If such be the case the exhibition of adrenalin would be physiologically and pharmacologically logical.

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MEDICAL ARTS BUILDING.

Unterberger, F.: Normal Delivery After Tubal Implantation. Monatschrift für Geburtshilfe und Gynäkologie, 1926, lxxiii, 1.

Last year Unterberger reported 3 cases in which he performed tubal implantation. In one case pregnancy immediately followed the operation. In all 3 cases two Rubin tests were done before operation and one during the operation but all the tests were negative. The proximal end of the retained part of the tube was implanted into the uterine cavity through a sagittal incision in the fundus. This is the first case of pregnancy following tubal implantation in Europe. (In America, Watkins and Cullen reported pregnancies following tubal implantation.)

In Unterberger's case the pregnancy was entirely uneventful. Delivery was accomplished by a low forceps operation. There was no postpartum hemorrhage and the puerperium was normal. In this case the uterine incision withstood not only the increased intrauterine pressure incident to pregnancy but also the contractions of labor.

The chief indication for tubal implantation is disease of the isthmal portion of the fallopian tube, such as salpingitis isthmica nodosa, cornual myoma and tubal pregnancy in the isthmus.

J. P. GREENHILL.

HOW SHALL WE DEAL WITH THE CANCER MENACE?*

By GILBERT FITZ-PATRICK, M.D., F.A.C.S., CHICAGO, ILL.

(Chairman Illinois Branch, American Society for the Control of Cancer)

DURING the past half century notable progress has been made in the scientific knowledge and treatment of disease, with the result that there has been a marked increase in the average duration of human life. A comparison of morbidity and mortality statistics shows a decided decrease in the incidence of all diseases except one. This one disease specter, which stands out conspicuously and defies all human progress, not only has not decreased its human toll, but is constantly increasing it, so much so that its destruction almost nullifies all the good that has been accomplished in other directions. Smallpox, diphtheria, tuberculosis, syphilis and a host of other death-dealing agents have been conquered, but cancer still stands in our midst defiant and unconquered.

This is the menace, the terrific importance of which to the whole nation, I wish to discuss in a general way; to outline its extent, its economic and social aspects, its cause as far as is known, and what might be expected in regard to dealing with it as a national health problem.

I can only present you with these general facts as far as observable by a clinician coming into contact with many cancer cases and following the development of the different phases of the cancer problem; but I can also assert that cancer is one of the most serious menaces which threatens us; that its increase is real and not apparent; and that it is not confined to any class of persons, or to any locality, but in general, striking the rich and poor, the weak and strong, the dweller of the town and of the open spaces, and seeking its victims at random from North to South, and from East to West.

STATISTICS OF CANCER

A recent analytic study of cancer mortality in the Registration Area of the United States by Schereschewsky of the United States Public Health Service, shows that there has been a pronounced increase in the observed death rate from cancer in persons of forty years and over. About one-third of this increase is due to greater precision and accuracy in filling out death certificates. The remaining two-thirds is, however, an actual increase in mortality, resulting in a death rate between 25 and 30 per cent higher than it was twenty-one years ago. During the same period, Schereschewsky finds that

*Read at a meeting of the Chicago Gynecological Society, January 21, 1927.

there has been a decrease of more than 40 per cent in tuberculosis mortality and nearly 50 per cent in the mortality from typhoid fever.

Massachusetts has the highest death rate from cancer of any State, equal to 126.8 per 100,000 population. In 1925 the cancer mortality in New York City reached 110 per 100,000.

According to statistics compiled by Hoffman, there is a real and alarming increase in cancer all over the world; not only among old people, but in the age group from thirty to thirty-nine years.

In the State of Mississippi the number of cancer deaths in 1925 was 50 per cent higher than in 1914.

The figures furnished by the Department of Public Health of the State of Illinois show that there were 6091 deaths in the State from cancer in the year 1921. In the year 1924 this had increased to over 7,000. In cities of 10,000 or more population in the same State, cancer deaths increased from 3,987 in 1921 to 4,580 in 1924.

Dr. G. H. Soper, in a recent article in the *Journal of Cancer Research*, states that, based on statistical studies, there are at the present time about 300,000 cases of cancer in the United States, and that the number of cases are about equal to three times the annual death rate. Hence we may take the annual toll from cancer as 100,000.

Soper states that at the request of the American Society for the Control of Cancer, the United States Census Bureau made a recalculation of the cancer death rate in the Registration Area of the United States, the revised rates throwing an entirely new light on the distribution of cancer. They show that the crude rates which are commonly employed are not only seriously in error, but positively misleading. There is actually much less difference in the prevalence of cancer in Northern and Southern States than has hitherto been supposed. According to Soper, the latest available information indicates that in the United States cancer is responsible for one in every eight of all deaths among men between fifty and seventy years old, and for one in every five among women between forty-five and sixty-five years old.

The statistical studies made by Dublin show that in the last fifteen years there has been an increase of 47 per cent in deaths from cancer in men over fifty years old and of 21 per cent in women above fifty.

THE ECONOMIC AND SOCIAL ASPECTS OF THE CANCER MENACE

Let us glance for a moment at this cancer question from an economic and social standpoint. The actual money-earning capacity of a man or woman in the fifth and sixth decades of life is of course less on the average than in the more active decades. Yet on the other hand, as we well know, the fifth and sixth decades are the periods when judgment is ripe, based on long experience, and viewed from

this standpoint, people of this age are the most valuable economically and socially of all persons in any community; but reducing the matter crudely to dollar values, I think most of us would agree that persons in the cancer age are on the average worth at least five hundred dollars annually to the nation. Since 100,000 die of cancer each year, if this scourge were abolished, it would mean fifty million dollars added to the national wealth each year. This may be considered as what cancer is costing us now in lost production quite apart from the actual cost to these unfortunate patients themselves or to the community for medical and hospital care. Of course, money figures of this kind are merely speculative approximations, and on the mere economic aspect I will only say that it has been reiterated again and again that public money spent in fighting and warding off disease yields the highest ultimate returns. As a public economic measure it would pay a community to spend money freely for preventing and fighting cancer.

Now let us look at the social and sentimental aspects of cancer. Cancer strikes us down when we have just arrived at the years of maturity, serenity, and discreet judgment; when we are most capable of appreciating and enjoying the best that human life and hope can give; when our long-sustained efforts and plans have reached the fruition from which we should justly hope to benefit; when we are surrounded by children and life-long friends and should reasonably expect that contemplative enjoyment which comes from work well done. Instead of the gradual, calm, and peaceful passing into the sleep of death without pain or remorse, which should be the happy ending of a well-spent life, foul cancer makes us a horrible leprous object shunned by those who are dearest to us, and both they and we ourselves can only wish for a speedy death as a merciful riddance of the gloom and misery of the horrible malady. How are we to avoid this awful fate? Cancer will surely take one out of every five women and eight men of middle age who will die in this community, and which of us will it be? We are careful to watch for the bandit on our highways; we bolt and bar our doors against the thief and assassin who comes in the night, but what are we doing to disarm this fiend who will take a much heavier toll from us than the bandit and midnight assassin?

WHAT IS CANCER?

Although medical science has accumulated a very large amount of knowledge concerning the evolution of cancer; although an army of the most astute and well-equipped workers all over the world are engaged in endeavoring to solve its nature, yet we must confess that at the present moment, we are in the dark as to the exact nature of cancer. Still a cordon is being drawn as it were about it; and it is

very likely that its exact cause and nature will soon be fully demonstrated. It will be appropriate here to glance succinctly at some of the most widely held views as to the nature of cancer.

First, let us review the germ theory: Many have claimed the discovery of a cancer germ. The most recent important contribution on this head was that put forward in July of 1925 by Gye and Bernard, but other investigators have failed to substantiate Gye and Bernard's claims.

The old irritation theory of Virchow cannot be considered as causal, but rather as a favorable and exciting circumstance in connection with the development of cancer. Just as certain locations in the body are sites of election for the settlement and breeding of specific bacteria, so are traumatized areas most likely places for the development of cancer; but most especially if the traumatism be continuous. Constant irritation or traumatism as an exciting factor is universally acknowledged, but it must not be considered as causative.

The trend of all important scientific research into the cause of cancer at the present moment seems to connect it with changes in the nutrition or metabolism of the cell; that is to say, to regard cancer as an abnormal cell development due to some disturbance between the balance of growth and function in normal tissue cells; or by a disturbance in the chemical balance of the cell constituents. Of course, this does not really get at the root of the question, because such cellular changes must still depend upon some ulterior causal factor.

To illustrate: I may refer to the fact that Clowes and Frisbie observed that in tumor growths there was also a disturbance in the potassium and calcium contents of cells. In a young, fresh, rapidly growing tumor, excess of potassium was always the rule; but in a degenerating tumor calcium was in the ascendent. But just how such a chemical disturbance in cell life occurs is not known.

Burrows has put forward an ingenious theory that cancer is the result of vitamine imbalance in the cells. Cancer cells contain no vitamine A but a high value of the fat-soluble vitamine B.

Sokoloff has perhaps done the most scientific work in investigating the relationship of the cell to cancer. Sokoloff's studies of cellular reaction and the problem, whether due to age or to the influence of mechanical or chemical irritants, affect the intracellular relationships and cause what is called cellular anarchy; that is to say, complete absence of the routine, orderly, normal development of the cell. Sokoloff finds an increased amount of glycogen in the malignant cell which seems to be directly responsible for increased growth energy. I have already referred to the potassium calcium imbalance in malignant cells, and both may be connected.

We cannot, however, consider cancer merely as a mechanical or chemical matter. The human or metaphysical aspects must be taken

into account. There is an agency beyond our control which regulates the functions of the body and correlates them with growth. This agency regulates new growth by replacing the tissue lost or changed by necessary function. A loss of the balance between growth and function may be and apparently is concerned in the development of cancer. We know that it is a physiologic law that failure of an organ to function leads to its atrophy, and misuse of function may also in the same way lead to abnormal growth and the conditions which predispose to or cause malignancy.

Some writers lay stress on the physiologic inactivity of organs being a causal factor in the production of cancer, especially cancer in the reproductive organs of the female. In Norway, Gade has remarked that cancer of the breast is more prevalent among women who do not nurse their children than among those who do. In the United States, Adair and Bagg have remarked the same thing.

These writers have made a very careful clinical study of 200 women suffering from *mammary* cancer in the hospital of the Cornell University Medical College. They found that in 91.5 per cent of these women there had been at one or more times a well-marked occurrence of breast stasis; i.e., milk stagnation or prevention of lactation when it was physiologic. *Mammary* cancer they consider is due to breast stasis and the resulting irritation that follows the retention of stagnant secretions in the breast.

Moreover, any organ which is not used for its legitimate physiologic purpose is likely to undergo involutive changes, and in the breast fibromatosis is likely to occur accompanied by connective tissue and epithelial proliferation. In such cases any chronic irritation, functional or other, may lead to fibroadenoma and carcinoma.

In this connection, I would like to hint that there may in the same way be a possible connection between the rapid increase in uterine cancer and the corresponding decrease in the bearing of children. It seems to be more than a mere coincidence that there should be a parallelism between the two, especially as the greatest increase in uterine and mammary cancer is observed in those countries in which race suicide is most prevalent. It was formerly believed that the constant uterine irritation incident to frequent childbearing was a cause of cancer. Statistics do not support this view except where the frequent childbearing was unaccompanied by proper lactation. Indeed, regarding this view, I may cite Dr. H. Gideon Wells, our distinguished pathologist, who recently pointed out that the dairy cow, which has the most overworked mammary gland in the world, never develops carcinoma and that the human subject which does less work in bearing children than any other animal, is the only one that has carcinoma of the uterus with frequency. I do not wish to be misunderstood as regards physiologic functioning. A woman who bears a child and

who refuses to use her lactating breasts is irritating them and not functioning physiologically; similarly a woman who persists in marital intercourse, which reflexly causes changes in the uterus incidental to pregnancy, but who at the same time constantly avoids pregnancy, is misusing her organs, and not functioning physiologically. Function is thwarted and the balance between it and growth is changed. The virgin, on the other hand, is not malfunctioning. As stated, I only hint this as a matter which may or may not be proved by further special study. What we know is that the United States leads the world in the prevalence of cancer of the female generative organs, nearly 50 per cent of all cancers in women being of this kind; at the same time such cancer is most frequent in those sections of the United States, such as Massachusetts, where the birth rate is lowest among the married population. *Verbum sat sapienti!*

In a general way, we may say that none of the existing views regarding the cause of cancer appear to be of any absolute value. All that we can with our present knowledge say is that tumor growth originates following repeated stimulation of tissue, whether such stimulation be a physical or chemical irritation or arising from parasitic or bacterial agencies. The recent International Conference for Cancer Control held at Lake Mohonk, New York, came to the conclusion that cancer was neither contagious nor infectious, and that it was not hereditary, although there appeared to be to some extent a susceptibility to it.

WHAT SHALL WE DO ABOUT CANCER?

As we do not know the underlying cause of cancer, our attitude toward it must of necessity be twofold: first, we must as far as possible, check the ravages of cancer by preventing its occurrence as far as it is in our power; and second, in the case of established cancer, we must cure it if possible; or if not, at least prolong the life of the cancer patient and make it as tolerable as possible. In addition we must make every effort to discover the origin and nature of cancer.

The first step toward the prevention of cancer is the thorough instruction of the people and medical profession in regard to the conditions that lead to it, and to watch for and recognize the premonitory signs, the danger signals of cancer. When we consider that one woman out of every five and one man out of every eight of middle age will die from cancer, it is certainly a matter which must of necessity be of vital concern to every one of us. The cancer menace must be made to loom large in the public eye by continuous advertising in public places, by newspapers, and by every public agency. The public must become familiar with those early danger signals of cancer which can be recognized without a special knowledge of the subject. Spasmodic action is very well, but the thing that counts is reiteration

of warnings. Ceaseless activity through the public press, and the fact that it reaches and is constantly read by the entire community makes it the best medium for disseminating information regarding the danger signals of cancer; but such dissemination must be constant. A mere "Cancer Week" in a community is excellent, but has only an ephemeral value. I wish particularly to stress the fact that the cancer menace must be kept constantly in the public mind.

The value of periodic examinations in the case of persons above the age of forty years cannot be too constantly impressed on the public. Also, family physicians should warn their patients of cancer age and advise examination for the premonitory signs of cancer; and otherwise, whenever the opportunity offers, they should themselves look out for such signs. To wait until there are manifest symptoms is a fatal policy. I think that in the past many physicians have been remiss or careless in this respect.

It is not alone, however, in middle-aged persons that the incidence of cancer should be suspected; a tendency is observed for the appearance of cancer in young persons. Fowler mentions 112 cases of pathologically demonstrated carcinoma and epithelioma in persons under twenty-six years old at the Mayo Clinic within ten years.

The question of immunization against cancer rises here. While experimental work gives a certain amount of promise of immunity to cancer through the blood (being possible), yet this subject is not at the present time in a stage in which it can be regarded as practical.

DIAGNOSIS OF CANCER

Twenty years ago cancer was a diagnostic clinical entity, today it is a microscopic fact. The future must develop both for the suspected and actual cancer patient a reliable biologic diagnostic test, a test that will rule out cancer or show its presence (in the organism) with certainty. Such a test would be of incalculable value in the initial stages when cancer gives no clinical symptoms. Even when suspicious clinical evidence is present, the average patient procrastinates, and it has been calculated that the average cancer patient delays eight months after premonitory signs before consulting a physician. Of course as we might surmise, certain tests are claimed as being diagnostic for cancer. In the Kotzareff's diagnostic test, an injection of radioecolloidal substance is made into the blood stream. If cancer be present, it is claimed that the rapidly dividing cells of the tumor fix the radium to such an extent that they will affect a sensitized plate.

Botelho also has recently devised a nitric reaction, a diagnostic test which although not exactly specific for cancer, yet seems to be the most reliably known method of serodiagnosis of malignant tumors.

Lavedan has recently reported a series of 111 cases of confirmed cancer in 74 per cent of which Botelho's test was positive. The great

majority of these cases were breast and uterine cancers. These tests require extensive laboratory procedures, and besides they are more applicable to advanced cancer. But what we want is a more simple method that will detect the very early specific changes, if any, that a developing cancer causes in the blood. The tests mentioned might perhaps be of use in a completely equipped cancer laboratory, but they scarcely come within the scope of the ordinary practitioner's armamentarium and he must still rely on his clinical acumen.

PUBLIC CANCER HOSPITALS AND CLINICS

One of the points upon which I desire to lay very particular stress is that the menace of cancer to the nation is so great, and the means of handling it so entirely inadequate, that its control must become a matter of State and National concern. The drain on our people from the fatal toll gathered by cancer renders it imperative that a determined public effort should be made for its prevention and control, and for applying such treatment as can be afforded. The reasons for State control of the cancer problem may be briefly summed up as follows:

1. Because special cancer hospitals with suitable equipment and personnel are required in which cancer patients can be received free or at a minimum payment according to their resources.

2. Because special Cancer Clinics in connection with the Cancer Hospitals are necessary, where anyone can have an examination to determine whether or not cancer is present, and if present to be promptly treated.

3. Because special clinical and laboratory research work is necessary. The laboratories would best function in connection with cancer hospitals where every clinical phase of the disease could be studied. The research work now being done is principally by privately endowed institutions.

These reasons call for little discussion, and further good reasons might be added. As regards the necessity for special cancer hospitals it is well known that there are entirely insufficient accommodations in our existing general hospitals. In fact, many hospitals refuse to receive inoperable cancer patients, who are sent home to die slowly. The average time for which an advanced cancer patient requires hospitalization before death, varies from about four to six or eight months. There is, I think, no more unfortunate being than the hopeless cancer patient lingering on at home for a year or two in bodily and mental anguish, a living death with the depression that is cast upon all, family and friends, by the knowledge that they can in no way help to obviate the inevitable issue. Formerly, when cancer cases were much fewer, there was a sufficient number of so-called Homes for Incurables, but the number of such cases now is so great

that they cannot be handled in this way even if such institutions were available. Besides this, a proper cancer hospital needs very special equipment and a specially trained staff.

The existence of trustworthy cancer clinics where an honest and unbiased examination and reliable diagnosis will be made, will also work great good among the large number of men and women who are nervous wrecks owing to their fear of cancer. There are many such people and they are the easy prey of quacks and cancer fakirs of all kinds. When it is fully known that these clinics have no monetary advantage in diagnosing a case as cancer, they will receive full public confidence.

These hospitals and clinics should offer an opportunity for special study by graduate students, as it is quite evident from the vast number of patients who, either through neglect or ignorance, are permitted to develop into an advanced condition of cancer that the general rank and file of the profession needs a better acquaintance with the initial phases of the disease.

CONCERNING THE TREATMENT OF CANCER

I may be permitted to say a few words here as to the treatment of cancer. While in the early stages surgery has been proved to be the best treatment, yet recurrence in advanced cases after surgery is so frequent that the difference in life duration between advanced operated and nonoperated cases is only a few months on the average. Radium and x-ray appear to be quite efficacious in certain early well localized cancers, and also as adjuncts to surgery when surgery is indicated.

Even in operable cancer of the cervix, some surgeons have abandoned surgery altogether in favor of radiologic treatment, as being more effective and less of a risk.

The newer researches on the nature of cancer would seem to suggest that, if this disease be really a disturbance in the cell nutritional balance, it may be possible to check it by direct medication through the blood. This branch of the therapeutics of cancer has been sadly neglected for many years owing to the supremacy of surgery. Thus Blair Bell, of Liverpool, England, and others, have shown that the administration of certain colloidal metallic salts, acts favorably on cancer cells. Bell has apparently obtained some remarkable results by the use of colloidal lead in the treatment of 250 hopeless human cancer patients; this treatment is being scientifically investigated in England with the aid of public funds. Bell claims that by this means, tumors may be made to shrink and disappear; also that colloidal lead has apparently a selective action on rapidly growing tumors. Bell further thinks that whatever risk may accompany the administration of lead, it is justified by the results obtained. The lead treatment

offers a chance for complete cure in one of five hopeless cases. This is the first time that medical treatment of cancer has offered a cure, and it may be the forerunner of other and better methods.

The efficient treatment of cancer requires the coordination of a group of physicians specifically trained in different specialties involved in dealing with cancer, and well acquainted with the phases of the disease.

PUBLIC INTEREST IN REGARD TO THE CANCER MENACE

In Europe the control of cancer has long been recognized as a matter of proper public concern and steps have been taken for its prevention and treatment. France, Switzerland, and Belgium have anti-cancerous centers under government auspices and the same matter is progressing in England and elsewhere. The Public Health Committee of the League of Nations is dealing with the matter. Germany, Sweden, Denmark, and Austria have special Public Cancer hospitals and Research Institutions.

In the United States we are just beginning to recognize the public aspect of the cancer menace. The State of Massachusetts took up the study of cancer as a State problem. They recognized that the problem was a large one, possessing complex medical, social, economic, and humanitarian aspects. Legislation providing public funds for cancer hospitals and clinics was passed in April, 1926.

Pennsylvania is also doing some work along the same lines. The report of its Cancer Commission shows that thirteen years of educational work has cut down the period between the discovery of the first symptoms in suspected cancer cases and the first call on the doctor from eighteen to fourteen months; and in cases of deep-seated cancer to nearly one-half. While this is not a very great accomplishment in itself, it is a basis at least for greater results from a proper and thorough State control of the cancer problem.

Finally, I wish to say that when the public understands and fully realizes the nature of the cancer menace, and how it is coming directly home to each one of us, it will rise up and demand public concerted action and the expenditure of public money for its control. The matter is not one to be trifled with. It is only by concerted intelligent cooperation between the medical profession and the public, that the cancer menace can be averted and the question of cancer solved. In the past, public insistence on the adequate treatment of tuberculosis has cut the death rate in two. Public demand has resulted in vast public expenditures in protecting the sources of water supply, in preserving the purity of food supply, and in obviating the spreading of infections and contagious diseases. The same public demand will awaken the medical profession and legislators to the necessity of dealing adequately with the cancer menace. It seems reasonable at least

that any steps which would be likely to prevent the occurrence of cancer and to provide adequate care for those afflicted with it, as well as a properly directed effort to find the real underlying cause of cancer and its treatment, should be fitting objects for the expenditure of public money. It is the people's government, and the people's mandate as regards matters which concern them must be acted upon by the people's elected representatives. Remember that one out of every five women, and one out of every eight men of middle age are now dying from cancer, at least a full decade before their natural time to die.

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122 SOUTH MICHIGAN AVENUE.

(For discussion see p. 681.)

CANCER OF THE UTERUS FOLLOWING AN INTERPOSITION OPERATION, WITH A REVIEW OF OTHER REPORTED COMPLICATIONS*

By JOHN A. MCGLINN, M.D., F.A.C.S., PHILADELPHIA, PA.

UNTIL a comparatively recent period prolapse of the uterus, with its attendant cystocele and rectocele, was probably the most difficult problem the pelvic surgeon was called upon to solve. The efforts of the older surgeons were in the main unsatisfactory. They were diligent in their efforts and acrimonious in their writings and debates.

In Dewee's *Diseases of Females* published in 1837, we find that the profession was at loggerheads as to the value of conservative treatment as instanced by the use of the pessary, astringent douches, astringent applications to the vagina, and closure of the vagina by adhesions, from the use of caustics on the one hand and operative procedures on the other. The operation then practiced consisted in a denudation of the vulva with suture of the two sides together, so

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that the opening into the vagina was practically closed. If the operation proved successful the patient was cured to the extent that the uterus could no longer project from the vagina. Dewees in speaking of the operation closes the chapter in this manner: "This horrible, severe, and ill-described operation is seriously proposed by Dr. F. (Dr. Frick) as a substitute for the simple, successful, and easily managed pessary."

Except for the work of Professor Burns, quoted in Ashwell's *Diseases of Females* published in 1845 and the operations to repair the lacerated cervix and operations on the anterior wall of the vagina introduced by Marion Sims, little progress was made in solving the problem between the years of 1840 and 1880. Burns' contribution was a notable one. He had as clear an idea of the anatomy of the pelvis and the anatomic causes of prolapse as we have today.

Byford, in 1881, was advocating the use of pessaries and astringents and criticizing the surgeons because in their operations they addressed themselves to but one item in the case. T. Gaillard Thomas^{1, 2} described his method of operating as follows: "The cervix is repaired, using silver wire: the second step in the case will be the taking of a 'gore,' so to speak, in the anterior wall of the vagina by the operation known as elytrorrhaphy, and then the final operation will consist in the restoration of the destroyed perineum."

The majority of authors, of this period, held that lacerations of the perineum were the most important etiologic factors. W. V. Jackson,³ however, made this observation: "I have never seen a case caused by a ruptured perineum nor have I met with a case cured by sewing up such a laceration."

James P. Boyd⁴ noted that the condition at times appears in virgins. He gave as causes: falls, torn perineum, and weight of uterus.

The next ten years show a marked advance in the treatment of prolapse, and we find the surgeons of 1890 making use of the ligamentary supports of the uterus in attempts to effect a cure.

Singley⁵ wrote: "There are two types of cases, those due to relaxation of the pelvic peritoneum (meaning ligaments) and those due to relaxed and torn perineums." He reports a case of failure after a Hegar operation which was cured by an Alexander operation.

Surgeons of this period were not in accord as to the cause and cure of prolapse. I. B. Will⁶ said of the chaotic condition of the subject: "The theories advanced have been well-nigh innumerable and the treatment advanced ranging all the way from that of a Virginia physician who hung his negro patients head downward and poured the vagina full of a decoction of tan bark, up to the most expensive silver and gold-plated uteroabdominal supports of modern times, on the one hand, and the narrowing of the vagina by plastic operations to the shortening of the round ligaments on the other."

The treatment by pelvic massage, after the method of Thure Brandt, of Stockholm, was also in vogue during this period.

In 1900 we find a definite advance in the treatment of prolapse. Watkins⁷ discussed methods of treatment in vogue at this time. He then described his method of operating, which was essentially a vaginal fixation of the uterus. Watkins eventually developed this operation into the interposition operation, one of the most important contributions to gynecologic surgical technic.

The first vaginal fixation was done by Schuecking⁸ in 1888, and Sanger⁹ described the operation in the same year. The operation was also described by Mackenrodt¹⁰ and Duhrssen¹¹ in 1892, and by Kuster¹² in 1894. Vaginal suspension was proposed by Vineberg¹³ in 1896 and also by Wertheim¹⁴ in the same year. These prior operations had to do with the correction of retrodisplacement of the uterus, and Watkins was the first to make use of the principle for the cure of prolapse.

Gynecologists were not all in accord with Watkins. Deaver¹⁵ advocated ventral fixation while Smith¹⁶ favored vaginal hysterectomy and plastic work. Werder¹⁷ advocated curettement of the uterus, amputation of the cervix, anterior and posterior colporrhaphy and ventral fixation; E. E. Montgomery,¹⁸ in discussing Werder's paper, suggested shortening of the uterosacral ligaments.

Fritsch¹⁹ proposed an unique operation. He anteverted the uterus through an anterior vaginal section, brought the fundus down into the vagina and sutured the body of the uterus both to the anterior and posterior vaginal walls.

The literature on this subject from 1900 to the present time is so voluminous that it is impossible to review it in a paper of this character. Of the many important contributions dealing with the anatomy of the pelvis may be mentioned: The description of the ligamentum transversus colli by Mackenrodt and papers by Jellet,²⁰ Tweedy,²¹ Keyes,^{22, 24} Williams,²³ and Fitzgibbon.²⁵ Many communications were presented dealing with the operative cure of prolapse. Of great value were the various papers of J. Riddle Goffe in which he described two bladder suspension operations. Important also were those of Alexandroff²⁶ and Tweedy,²⁷ dealing with Mackenrodt's ligament for the cure of prolapse; of Jellet²⁸ and Bove on the shortening of the uterosacral ligaments; ventral fixation by Harris, Murphy, Baldy, and Kocher and the Mayo interposition of the broad ligaments.

Out of all this flux has come one operation that seems destined to stand the test of time, an operation which when done in properly selected cases guarantees almost 100 per cent of cures, the perfected interposition operation of Watkins.

It is too much to expect any operation to be perfect in all respects

and it may be profitable to review some of the complications which have followed this operation.

H. N. Shaw²⁹ reports 118 cases of interposition operations on patients at the Johns Hopkins hospital. These were done chiefly on dispensary patients in whom the follow-up questionnaire could not be obtained in a number of cases. However, in those cases where the end result was obtained there was but one real failure. This patient was a scrub-woman who worked very hard. She had a recurrence of her prolapse with prolapse of the entire pelvic floor, the bladder appearing at the vaginal orifice as a red ulcerated mass with the uterus still below it. A ventrofixation was easily performed and but few adhesions to the uterus were encountered. In this series of cases there were two subsequent pregnancies, both with great discomfort during pregnancy and very difficult labors.

C. Jeff Miller³⁰ reports 50 cases of interposition operation from his private practice. All were effective in relieving the prolapse for which they were done. Three women suffered with incontinence, in one case coming on after six years of complete cure, another occurring on slight jolts or jars, and the third occurring in an extremely neurotic patient without other demonstrable cause. None of these patients were cystoscoped to determine the presence of a local cause for the incontinence.

H. Boldt³¹ reports a case of uncontrollable hemorrhage following an interposition operation. The bleeding could not be controlled even by zinc chloride, and a hysterectomy had to be performed two and a half years after the original interposition operation. The hysterectomy was very difficult and a large tear was made in the bladder. On pathologic examination of the uterus nothing but chronic endometritis could be discovered.

Polak,³² in discussing the paper by Boldt, stated that he was obliged to perform hysterectomy in four cases on account of menorrhagia following interposition operations. In all these cases the interposition operation had been performed after the menopause. On account of the extensive adhesions usually encountered in such cases he now leaves a portion of the body of the uterus as a floor for the bladder instead of attempting to dissect out the entire bladder.

I. F. Stein³³ reports four cases of pregnancy following interposition operations. All were delivered by cesarean section. In one case the child was stillborn. He calls attention to the marked prevalence of transverse presentations and of placenta previa in the reported cases of pregnancy following the interposition operation. He also notes the posterior sacculation of the uterus, the marked bladder symptoms, the severe abdominal pains, and the incontinence or inability to void spontaneously during pregnancy. He also calls attention to the ineffectual labor pains, the danger of rupture of the uterus, the difficulty of applying forceps, performing craniotomy or other operative procedures per vaginam and to the practical necessity of doing cesarean section in all cases. He strongly urges that the interposition operation be reserved for postlimbaetric cases or that artificial sterilization be performed when the operation is done in the childbearing period.

Loomis³⁴ reports one case of pregnancy with placenta previa following the interposition operation. Davis³⁵ reports one case of pregnancy delivered at term by section with no unusual features. Hertleson³⁶ had a case of pregnancy terminated by a very difficult craniotomy, after seven days of labor, followed by severe maternal sepsis.

Freund³⁷ reports a case of pregnancy delivered by section with no unusual features.

Esch³⁸ had to resort to section to deliver his case.

Graefe reviews eight cases of pregnancy reported in the German literature and adds a case of his own. In this latter case pregnancy had to be terminated by vaginal cesarean section on account of pain and retention of urine.

Weibel³⁹ reports seven cases of pregnancy following the interposition operation. Five are from the German literature and two from the Frauen Klinik at Wien. One patient aborted at the fourth month and the other was terminated ten days short of term by section on account of polyhydramnios and severe abdominal pain.

O. V. Franque tells of a case of pregnancy two years after the tubes had been resected at the time of the original operation. The patient had retention of urine and had to live a catheter life during pregnancy. This case was terminated by section.

Holland⁴⁰ collected three cases of pregnancy from the English literature. All had to be terminated by cesarean section.

Weber⁴¹ reviewed forty-three cases of interposition operation with 2.4 per cent recurrence of the prolapse. All the other cases were entirely successful. Two cases of pregnancy occurred in the series in both of which a resection of the tubes had been done at the time of the operation. He believes that conception had occurred prior to the performance of the interposition operation and now advises a preliminary curettage in all cases.

Grad⁴² studied twenty-three cases after the operation. Nineteen were entirely successful, two were partly so, one had a recurrence of the rectocele and one had a shortened anterior vaginal wall. One patient died of gangrene of the left leg. There was one case of pregnancy with break down of the perineum following labor.

Josef Pepper⁴³ reviewed the question of priority and gives Watkins credit for originating the operation. In his early experience with the operation his mortality was between 6 and 7 per cent; it is now less than 2 per cent. Since 1915 all cases of prolapse in his clinic have been treated by interposition. Between 1915 and 1920 ninety cases were so treated, four of these as reoperations after failure of other operations. There were two deaths, one from bronchopneumonia and one from septicemia. He had 92.4 per cent complete cures; 6.4 per cent partial failures, and 1.2 per cent total failures. There were several cases of menorrhagia following the operation. In one case hysterectomy was done, and x-rays cured the others. He mentions a case of Wertheim's⁴⁴ in which hysterectomy had to be done on account of hemorrhage. He had no cases of malignancy in his clinic.

Halban and Thaler each report one case of pregnancy both of which aborted at the third month.

Mainzer, Lynch, and Kosmak each report a case of pregnancy terminated by section.

Cragin had two cases of pregnancy terminated by section at full term. and the other was sectioned.

Westermack cites a case of bleeding and discharge five years after the operation. It was impossible to enter the uterus through the cervix. The fundus was approached through the anterior vaginal wall. A small fibroid was found in the fundus following the removal of which recovery ensued.

Hirst has had three cases of pregnancy: two patients aborted at the third month

To these reported complications I desire to add another, the counterpart of which, I have not been able to find in the literature.

In all, I have seen three cases of intractable bleeding after the interposition operation. One patient operated upon by another surgeon two years previously, came under my care complaining of persistent bleeding. The operative result was excellent and there were no ulcerations of the vagina or cervix. The bleeding was coming from the interior of the uterus and as the uterus could not be entered through the cervix, splitting the uterus through a vaginal incision was advised. This advice was not accepted and the patient was lost sight of.

The second case, Mrs. K., aged fifty-six, was operated upon by me in April, 1924, for complete prolapse of the uterus and vagina. The uterus was curetted and a lacerated and ulcerated cervix was treated by high amputation. A

typical Watkins' interposition operation and colpoperineorrhaphy completed the operative procedures. She made an uncomplicated recovery with cure of the prolapse. The histologic studies of the cervix and curette scrapings were negative for malignancy. She remained well until about September, 1926, when she began spotting, which continued at irregular intervals until January, 1927, since which date the bleeding has been continuous. She entered St. Agnes Hospital, February 1, 1927. Examination on that date showed an excellent operative result with vagina and cervix free of disease. The uterus well anteposed, was normal in outline but somewhat larger than it was at the time of operation.

The uterus, on account of its position, was entered through the cervix with great difficulty. The uterine cavity was curetted and a 50 mg. capsule of radium was inserted and allowed to remain in the cavity for twenty-four hours. Histologic studies of the curette scrapings showed adenocarcinoma. As the malignancy was situated in the body of the uterus we did not care to depend on radium and a complete hysterectomy was advised. On February 16 an attempt was made to free the uterus and remove it through the vagina. This was found impossible of accomplishment, and the uterus was removed by the abdominal route.

The bladder was densely adherent to the posterior wall of the uterus, with the uterus deep in the pelvis, the fundus being firmly fixed under the pubic arch. No point of cleavage could be found between the uterus and bladder, and they had to be separated by scissors dissection. On account of the depth of the organs in the pelvis and free bleeding, dissection had to be done by touch and not by sight. Fortunately the bladder and ureters were not injured. After the bladder was freed an attempt was made to free the uterus from the vagina. Again no point of cleavage could be found, and it was necessary to cut the uterus out with scissors guided by touch. When the uterus was removed it showed the anterior vaginal wall densely adherent to its anterior surface. The rent in the vagina was closed and a small wick of gauze drainage was inserted to take care of the oozing which could not be completely controlled.

The uterus showed a small polyp at the fundus which on histologic examination proved to be an adenocarcinoma.

The patient was discharged from the hospital in satisfactory condition one month later. The most noteworthy feature of the operation was its extreme difficulty.

A third patient upon whom I operated six months ago for complete prolapse entered the hospital today (May 13, 1927) complaining of severe bleeding for the past month. In this case the uterus was curetted, the cervix amputated, the uterus interposed, and the perineum repaired. Examination of the patient revealed a partial failure, the cervix being near the vulva with some prolapse of the bladder. Situated in the cervix was a proliferating ulcer about one-half inch in diameter.

From this review the following conclusions can be drawn:

1. In properly selected cases the Watkins' interposition operation is the best treatment, so far devised, for the cure of prolapse of the uterus and vagina.
2. Pregnancy is a serious complication when it follows the operation. Practically all cases so far reported had to be terminated by cesarean section.
3. If the operation is done before the menopause, artificial sterilization should be done.
4. Cancer may develop in the uterus after the operation. The operation does not play any part in the development of cancer, and the fact that it may occur in no way condemns the operation.

5. All diseased cervixes should be removed by high amputation.
6. Bleeding from the body of the uterus after the menopause should be a contraindication for the operation.
7. Hysterectomy, after the operation is likely to be a hazardous and difficult operation.

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1530 LOCUST STREET.

(For discussion, see p. 670.)

Graca, Ludevit; A Check Pessary in the Uterine Os as Cause of Chronic Polyarthrits. Bratislavske Lekarkse Listy, 1925, v, 27.

In this case the etiologic relation of a chronic polyarthrits to a cervical check pessary could be clearly established. A young woman was for five years treated for a severe articular rheumatism when a uterine hemorrhage appeared. This seemed caused by a cervical stem pessary worn by her for years. It was promptly removed, and not only all hemorrhage ceased but also prompt improvement of the joint affection could be noticed. The only slightly affected joints became perfectly normal, and those chronically changed exhibited marked amelioration.

AUTHOR'S ABSTRACT.

RESPIRATORY EMPHYSEMA IN LABOR*

WITH TWO NEW CASES AND A REVIEW OF 130 CASES IN THE LITERATURE

BY CHARLES A. GORDON, M.D., F.A.C.S., BROOKLYN, N. Y.

THE occurrence of air in the subcutaneous tissues is an unusual and interesting complication of labor,—an accident probably occurring more often than has been recorded in the literature, and interesting because of the dramatic onset of the lesion and our lack of positive knowledge of its etiology and pathology.

Case reports are usually prefaced by unsupported statements as to its rarity,—Charbonnet in 1925 stated that “a search of the literature has failed to disclose mention of a single case.”

Air has, of course, been observed in the cellular tissues of the neck and face in conditions other than parturition, as in measles, whooping-cough, pneumonia, foreign bodies in the bronchi, wounds of the lung itself, tracheotomy wounds, and even from blowing the nose. In labor, too, we must carefully distinguish between subcutaneous emphysema arising from the activities of gas-forming organisms in the birth canal, or that occasionally seen with penetrating wounds, ulcerating growths and rupture of the uterus, and emphysema due to a rupture somewhere in the respiratory tract. Although usually accompanied by a definite clinical picture of vastly different significance and import, some confusion exists because all these have been called subcutaneous emphysema of labor; while Champneys in 1842 spoke of expiratory cervical emphysema, no other term has ever been suggested.

If the presence of air in the cellular tissues during labor were classified from its point of origin, that arising from the genital tract might be called peritoneal emphysema and all the rest, respiratory emphysema of labor. The need of a more definite terminology in obstetric emphysema is apparent.

Although possibly not unknown to early medicine, no historical references could be found. Louise Bourgeois, however, midwife to the Queen of France, publishing her “Observations” in 1617, may have referred to it when she wrote: “I saw that she tried to stop crying out, and I implored her not to stop, for fear that her throat would swell.”

The first case was reported by Simmons in 1783. Since then many cases have been reported, and from time to time some effort has been made to collect cases and evaluate experiences. De Paul in 1842 first drew attention to it, and in 1874 Haultecoeur wrote the first thesis

*Read at a meeting of the New York Obstetrical Society, February 8, 1927.

collecting 13 cases. Champneys in 1885 attempted to explain its etiology by a series of experiments. Roche collected 32 cases in 1894, Nicaise 54 cases in 1896, Klots 40 cases in 1899, and Kosmak, reporting a case in 1905, with the only photograph in the literature, was able to find 77 cases. Since then no complete report has appeared.

It seemed advisable, while reporting two cases of my own, both observed in the Greenpoint Hospital, to review all the cases in the literature and bring Kosmak's series down to date. In all 50 new cases have been found, 22 of these escaping Kosmak's search, and the others appearing since the publication of his paper. These with the 77 cases reported by Kosmak make a total of 130 cases, which I believe includes all the cases in the literature after a careful search in which all the original sources since 1617 have been consulted. My own cases follow:

CASE 1.—A. S.; white, primipara, aged twenty-three, was admitted at term, to the Greenpoint Hospital on October 4, 1924 in labor. Her pregnancy had been normal except for persistent vomiting. Her heart and lungs were negative, blood pressure 126/84, and external pelvic measurements were ample, intereristal 25 cm., interspinous 23 cm., external conjugate 20 cm., bisischial 8.5 cm. The fetal heart rate was 138, and the position left occipitoanterior.

The first stage was prolonged with strong regular three minute interval pains. At the twelfth hour, $\frac{1}{4}$ gr. morphine was given; at the sixteenth hour the right side of her face and neck was seen to be swollen, and within the next half hour this swelling spread to the left side and back of the neck, and down the chest to the nipple level. Air crepitation was felt over this area and slight tenderness was present. Her general condition was excellent, and there were no subjective symptoms except discomfort due to the swelling. Her cervix was but half dilated, the membranes still intact, and the slow descent of the head was thought to be due to poor flexion. Six hours later with full dilatation the membranes ruptured, and forceps were applied to the head under ether anesthesia. The swelling had not increased. Delivery was somewhat difficult, and the baby was stillborn. The baby was large with large head and marked moulding and caput. The placenta was easily expressed after separation, and a second degree laceration of the perineum was repaired at once.

Eight hours after delivery the emphysema was seen to have spread over both sides of the face to the scalp of the parietal region. She made an excellent recovery with slight febrile reaction for four days. Her blood count the day after delivery was R. B. C. 4,550,000, Hgb. 83 per cent, W. B. C. 12,600, lymphocytes 26 per cent, polymorphonuclear cells 73 per cent. The emphysema had entirely disappeared on the fifth day.

CASE 2.—M. C. white, primipara, aged twenty, was admitted at term, to the Greenpoint Hospital on September 24, 1926 in labor. At six years of age, two ribs on the right side had been resected for empyema. Her pregnancy had been normal, heart and lungs were negative, blood pressure 134/90 and the external pelvic measurements were ample, intereristal 27 cm., interspinous 24 cm., external conjugate 20 cm., bisischial 8 cm. Enlarged thyroid.

The first stage lasted twenty-eight hours, but except for the last two hours, pains were irregular and never closer than fifteen minutes. Two hours before complete dilatation, the membranes ruptured, and pains became stronger and

closer. After a second stage of almost six hours she was delivered spontaneously of a living child, weighing 3,800 gm.

After waiting forty-five minutes for separation of the placenta, Cr  d   expression was unsuccessful, sharp hemorrhage occurred, and the placenta was removed manually and the bleeding stopped.

Three hours before delivery swelling of the right side of the neck and face was noticed and a crackling area of emphysema was found to extend on the right side from the infraclavicular space to the zygomatic arch, on the left side of the neck from just below the clavicle to the lower jaw and backward to the trapezius muscle. Except for slight difficulty in breathing and slight cough she felt well. Convalescence was uneventful and afebrile throughout, the emphysema gradually disappearing; on the fifth day it was present only just above the right clavicle, where the presence of air could be detected for five days more,—ten days in all.

The blood count on the day after delivery showed R. B. C. 3,550,000, Hgb. 60 per cent, W. B. C. 10,000 with 32 per cent lymphocytes and 68 per cent polymorphonuclear cells. Urine and Wassermann tests were negative. Roentgen examination by Dr. Van Winkle on the day after delivery showed evidence of air or gas in the soft tissues, especially the right and left infra- and supraclavicular areas. The lung fields showed no evidence of infiltration or opacity. Right and left large cervical ribs were present. The heart shadow showed no abnormality in outline.

Another roentgen examination made ten days later showed no shadows suggesting air in the soft tissues of the neck. The apices were clear, and the lung fields showed no infiltration or opacity. No fracture of the cervical ribs was seen. Rib deformity present in the lower right chest, at the site of the old resection. At this time a careful examination of the chest was made by an internist who was able to find nothing abnormal except the old operative scar. The heart was negative and the lungs perfectly clear. No evidence of old pleural pathology could be discovered.

Laryngoscopic and bronchoscopic examinations were made on the third day postpartum. Nothing abnormal was seen.

Both these cases occurred in healthy young primiparae with somewhat prolonged labor, due in the first case to disproportion, and to a poor first stage in the other. Labor pains and straining were no worse than usually seen in primiparous women. In the first case no predisposing cause could be found, while old pleural pathology may well have been the underlying cause in the other. Their clinical course was similar. The cases recorded in the literature, however, differ widely from each other, yet have much in common. In order to establish a continuity of research, and provide a proper background for the study of this interesting clinical phenomenon, all the cases in the literature not abstracted by Kosmak in the Bulletin of the Lying-In Hospital of the City of New York, March, 1907, are abstracted below. The first reported case is worthy of literal reproduction.

“A case of Emphysema, Brought on by Severe Labour Pains. Communicated by Samuel Foart Simmons, M.D., F.R.S., Read June 17, 1783 (*Medical Communications*, Lond., 1784, i, 176).

“In a conversation with Dr. Bland, physician, man midwife to the Westminster General Dispensary, I happened to mention the remarkable case communicated lately to the Society by Dr. Hicks. This brought to his recollection a curious

instance of a similar affection, which occurred to him several years ago in a female patient, and which was evidently the effect of severe labour pains. As cases of this sort are extremely rare and interesting, and do not seem to have been hitherto sufficiently noticed by medical writers, I requested Dr. Bland to give me the particulars of the fact in writing, and he has accordingly favoured me with the following account, which I shall present to the Society in his own words: 'Mrs. J. Ismay, the wife of a watchmaker in Chancery Lane, a strong and healthy young woman, in the course of a tedious and uncommonly severe labour forced a quantity of air into the cellular membranes of her neck. Her whole face and neck and the upper part of her body were enlarged; her eyes were inflamed and her eyelids so swelled that for some time afterwards she could with difficulty open them. The space occupied by the emphysema might be covered with a hand, and the center of it was about the point where the right clavicle joins the sternum. It was not perceived until the day after the patient was delivered, but the crackling occasioned by pressing any part of that space left no room to doubt what the tumour contained. It occasioned but little trouble or uneasiness, and was entirely dissipated within ten or twelve days.'

Frank, J. P.: *Traite de Medicinc-Pratique*, Paris, 1842, ii, 11.

"The emphysema occurring during labor, when the woman throws her head back is caused by tears in the larynx or trachea. We saw in one woman the swelling start in the neck, spread to the face, head and all the upper part of the body; it disappeared in twelve days."

Davies, F.: *Prov. M. and S. J.*, 1845, p. 147.

On December 10, 1829 at 6:00 P.M. he saw a primipara. After almost three days of labor, straining violently in her second stage, she was delivered normally at 5:00 A.M., December 13. Fifteen minutes after delivery of the placenta, she complained of great difficulty in breathing and he saw her face, throat and breast swollen to three times their normal size and of a bright scarlet color. She also had great pain in her throat, about two inches above the sternum and difficulty in breathing increased rapidly. He felt a distinct crackling and felt that she had ruptured her trachea. Pulse 110. Venesection 30 oz., and again 16 oz. She had had severe postpartum hemorrhage. Rapid recovery and argument for bleeding from the arm in P. P. hemorrhage.

Rump, H. R.: *Assn. Med. Jour.*, 1853, pp. 365-9.

Primipara, aged twenty-six, was in coma for three days with many severe eclamptic convulsions. Phlebotomy. During a convulsion her neck suddenly increased in size, and marked emphysema spread over her face and entire body. Delivery shortly after. Slow absorption of air. Recovery.

Three patients consulted him for a tumor in the neck which had appeared during labor. In all three the tumor disappeared or grew smaller during inspiration and increased in size during expiration. Mass soft, elastic, tympanitic, and not tender.

1. During her third labor she felt something burst in her neck and swelling suddenly appeared on the right side of the neck. This tumor increased in size with five subsequent labors.

2. During her first delivery, aged twenty-three, while bearing down she felt something give way in her neck. This tumor grew larger in two subsequent labors.

3. During her first delivery, aged twenty-two, she felt a tearing sensation in the neck, and while bearing down swelling appeared. Enlarged during subsequent labors, and Mr. Parry whose case it was, saw a remarkable increase in its size during expulsive pains.

Lize, M.: *Bull. de la Soc. d. Chir. de Par.*, 1860, i, 529.

Primipara, age seventeen, robust, after four days of extremely difficult labor L. O. A., delivered spontaneously. During this time she had not ceased crying. After delivery a tumor the size of a fist was noted extending from the inner half of the clavicle to the angle of the jaw. Mass was pear-shaped, boggy, elastic, giving way under pressure without diminishing in size, and tympanitic on percussion. The tumor increased in size when she cried out. Two days later the mass was but half its original size, and on the ninth day the neck was almost normal. The mass was not present before labor began.

Pratt, T.: *Med. Press and Circ.*, Lond., 1870, lx, n. s., 409. Discussion, 411.

Primipara, aged twenty-three, strong and healthy. Labor in all eight and a half hours. One hour before delivery with head on perineum she complained of stiffness of the eyelids and swelling of her face. As labor progressed so did the swelling until her eyes were nearly closed and face, neck, chest and greater part of her body puffed, much difficulty in breathing, marked crepitation over swelling. Twenty minutes later her baby was born. Swelling was very bad the next day but gradually lessened and was entirely gone on the eighth day. Her elder brother and several of her uncle's children had died of tuberculosis.

2. Primipara, aged twenty-three, healthy. Normal presentation. Two and a half hours after rupture of the membranes, fourteen hours after the onset of labor, she complained of stiffness of the eyelids and swelling of the face. The baby was born two hours later and was very small. Labor throughout was feeble, sixteen and a half hours in all. Emphysema spread over face, neck, chest, arms and greater part of her body. She had no difficulty in breathing. On the eighth day it had disappeared. Her father had married three times and had a very large family all of whom died of tuberculosis except two.

Kirkpatrick, J. R.: *Med. Press and Circ.*, Lond., 1870, lx, n. s., 411.

Discussing Pratt's case, Kirkpatrick said he had seen a case in a multipara with emphysema which extended over lower part of the chest and body and disappeared the next day.

O'Leary: *Med. Press and Circ.*, Lond., 1870. (Quoted by Roche, original reference not found.)

Woman, aged twenty-six during miscarriage made violent efforts. Emphysema spread over the entire neck and a great part of the chest. Auscultation of the lung showed a cavity in the apex which apparently had ruptured.

Isdell, J.: *Irish Hosp. Gaz.*, Dubl., 1873, i, 38.

Isdell saw two cases in thirty years. One, a second labor, had some obstruction in the second stage. While making violent expulsive efforts swelling suddenly appeared in her neck and increased with each pain, spreading over the face and down the chest, arms and leg. The strange part was that it stopped exactly at the midline and was all on the right side. The swelling was so great as to impede respiration and there was danger of suffocation. Bleeding followed by delivery with forceps. Disappearance of air in two weeks.

2. Primipara with pains of great violence was first seen in the second stage with head low. Forceps. Her face and neck puffed out so as to alarm those about her.

Dunn: *Boston Med. and Surg. Jour.*, 1883, cviii, 397.

Dr. Otis, discussing Dunn's case (Kosmak) said that in a case that had come under his observation the symptoms were not discovered until two hours after the labor was over.

Greslou, M.: *Soc. Obst. et Gynec. de Par.*, 1891-2, pp. 211-12.

Primipara, aged twenty-four, with no previous lung pathology, delivered spontaneously, a baby weighing 4 kg. in right occiput posterior position. First stage, thirty hours; second stage only two hours; toward its end during sustained forcible effort, she suddenly felt her right cheek swell and a sensation of crackling; a soft painless swelling was felt at this point. During subsequent efforts this air spread to the neck and after delivery distended both sides of the face tremendously. Coughing and thoracic distress for two days when swelling rapidly subsided.

Roche, F. N.: 4°, Paris, 1894. Reports three cases of M. Pinard.

1. Primipara, aged twenty-three in good health. Twenty-four hours in first stage L. O. A., two hours in second stage. After delivery she complained of her neck and showed area of emphysema at base of neck especially on right side, anterior chest to nipple level. Recovery.

2. Primipara, aged twenty-two, negative history. L. O. P. Twenty-four hours in first stage. After seven hours in the second stage, no rotation, delivery was effected by forceps. Two hours after delivery complained of dysphagia, dyspnea and pain in breathing. Emphysema noted in neck, face and chest, anteriorly to nipple level and posteriorly to scapulae. Subsided in ten days.

3. Primipara, aged twenty, L. O. A. Seventeen hours in first stage; three hours in second stage. Spontaneous delivery. After delivery she complained of pain and swelling of the neck and emphysema was noted on both sides of the neck and face, particularly marked in parotid region. Recovery.

Freeman: *Lancet*, Lond., 1896, i, 705.

Primipara, aged twenty, slight, healthy woman with good previous history, in labor first stage nine hours. Second stage was terminated by spontaneous delivery three hours later. Pains of second stage very severe. One hour before delivery she said her face felt tense and swollen and it was seen to be swollen. After delivery "her face was enormously distended as well as her throat, shoulders and chest down to about her third rib." Marked crackling. Complaint of breathlessness and constriction of throat. During efforts to expel the placenta, swelling increased and the breathlessness became worse. Firm pressure on the neck relieved her temporarily. Emphysema disappeared on fourth day.

Szekely, Z.: *Gyogyaszat*, Budapest, 1901, xli, 537. Also translation: *Pest. med-chir. Presse*, Budapest, 1901, xxxvii, 949-952.

Primipara, aged twenty-nine at term. Over a year before had pain in the side, cough and hemoptysis. During labor had hemoptysis three times but had not coughed for three months before. Two days in first stage with weak pains; nine hours in second stage with unusually severe pains due to large baby and rigid soft parts. Face, upper and lower eyelids, neck of right side suddenly swelled up during these pains and swelling spread over whole face, neck, chest, back and abdomen. Labor lasted long after the appearance of the air which kept on increasing during labor. Swelling was normal in color, not tender, no increase in temperature. Spontaneous delivery. Three days later head was much swollen (twice its size). Emphysema extended to symphysis. Examination of chest showed only roughened breathing at right apex.

Essen-Møller, E.: *Hygien*, Stockholm, 1904, 2. f., iv, 708-714.

Primipara probably, although not stated, unmarried, at term. After fifteen hours of good pain in the first stage, cervix was almost fully dilated, membranes ruptured, and the brow fixed in the pelvis. Low contraction ring. Morphine and chloral. Twelve hours later marked emphysema was seen on neck, face and upper

eyelids, left arm to wrist, slightly on right arm, chest and abdomen to the umbilicus. Weakness, dyspnea, and thoracic distress. Forceps delivery of live baby. Dyspnea persisted a few days and disappeared with the emphysema which was still present in the infraclavicular fossae when was discharged on the tenth day.

Emmerson, W. M.: *Lancet*, Lond., 1904, ii, 595.

Primipara, aged twenty-two, in good health and in labor thirteen hours with a face presentation, had a normal delivery. With strong labor, head on the perineum for one hour, immediately after the last pain which was long and very severe, her face was seen to be swollen, and she complained of dyspnea. On the next day swelling was seen on neck and chest. This lasted four days. No pneumothorax. No discomfort except choking sensation and slight shortness of breath. Convalescence was uneventful, and careful subsequent examination of the chest revealed no alterations in the percussion note at the apices, or elsewhere, and no signs of tuberculosis. Emmerson believed her condition to be due to "rupture of air vesicles on one or both sides of the chest, caused by the violent bearing down effort, the air escaping into the neck at the root of the lung." Fetus was stillborn with posterior hydronephalocele and omphalocele.

Hergott, A.: *Ann. gynec. et d'obst.*, Par., 1904, 25, i, 643-650.

Primipara, aged twenty-eight, vertex, long first stage with poor pains and slow progress in the second. After four hours with the head almost at the vulva, 50 eg. of quinine was given. A half hour later she delivered. Just before delivery she suddenly felt pain in the left side of the chest and had difficulty in breathing. At that moment, she said her neck began to swell. A few hours later mediastinal emphysema was found, and the next day emphysema was present on both sides of the neck, left supraclavicular fossa, and the chest over the first two interspaces. Six days later it had all disappeared.

Smith, W.: *Stethoscope*, Bristol, 1904, vii, 43.

Primipara, aged twenty-seven, healthy but very thin. Labor progressed slowly until perineal stage. Pains then became strong and lasted much longer. Then eyelids suddenly became swollen and she could not see out of left eye. Swelling rapidly spread over whole face, neck and anterior chest to the third rib. On the fourth day it disappeared.

Viana, O.: *Ginecologia*, Firenze, 1907, iv, 164-175.

Primipara, aged twenty-one, obese, "constantly suffering from coryza." At term, pains weak and infrequent, she progressed slowly, head long time on perineum, membranes ruptured artificially at the vulva, and she delivered spontaneously after being in labor eighteen hours. During the second stage swelling of the left cheek was noticed. After delivery, the entire left and upper anterior chest as well. Crepitation. No pain but sense of tension over face and some dysphagia. Examination of lungs negative. Next day right cheek was swollen; on the third day swelling was seen over the left lacrimal duct area. All had disappeared on the sixth day. Examination of nose and throat showed swelling of left side of the pharynx, negative larynx. Probe demonstrated roughness in nasolacrimal duct where it was thought air had broken through.

Basso, G. L.: *Ginecologia*, Firenze, 1907, iv, 723-728.

Primipara aged thirty-one, always well except for frequent nosebleeds during pregnancy. Vertex, L. O. A. First stage lasted twelve hours, membranes ruptured early. During the first hour of the second stage, with great effort in bearing down swelling appeared over the left cheek, then the right, spreading to the eyelids, orbit, neck and chest over the sternum. Dysphagia and nasal voice. Forceps delivery. The emphysema had disappeared by the sixth day. Examination of the

lungs, larynx and lacrimal apparatus was negative. The mucous membrane of the nose showed crusts, bleeding and mucopurulent catarrh.

Jardine, R.: *Jour. Obst. and Gynec. Brit. Emp.*, Lond., 1907, xi, 413.

Primipara, aged twenty-two, four hours after midwife had ruptured the membranes, felt a choking sensation and fulness in her neck. This increased with every attack of vomiting and quickly spread to the face and eyelids. When admitted to hospital, she was exhausted, with face much swollen and neck, chest and part of abdominal wall emphysematous as well. All more marked on right side. Very little discomfort except on deep inspiration, when she complained of lacerating pain over the apices of both lungs. Pulse very feeble, 130. Retraction ring. Distended bladder. Os slightly dilated manually and forceps tried with no result. Craniotomy. Emphysema all disappeared on the seventh day. Recovery uneventful. Careful examination of her chest showed nothing except that the breath sounds over the apex of the right lung were somewhat harsh but there were no râles. Slight cough but no expectoration.

Fabre and Trillat: *Bull. de la Soc. d'obst. de Par.*, 1908, xi.

Primipara, aged eighteen, subject to coughs. After a labor of seventeen hours membranes ruptured, violent expulsive pains occurred and the head was found on the perineum. Caput was seen at vulva for four hours, pain getting worse, when the head was delivered in posterior position by means of a fillet. Laceration of perineum sutured. After delivery noticed emphysema of cheeks, neck and subclavicular region. Patient was positive that she had felt her left cheek swelling and discomfort in the neck during her expulsive efforts. Very little pain. No lesion of trachea, mouth or lungs found on examination. Two days later the emphysema had spread symmetrically down the chest to the nipple level and to the back of the neck. Disappeared entirely in eight days.

Lederer: *Frauenarzt*, Leipz., 1908, xxiii, 388-390.

Para ii, aged thirty-five, marked albuminuria, no edema and blurred vision. Normal birth of small baby after short labor. Total blindness followed. Twenty-four hours later, neck was swollen but not painful. No difficulty in breathing. Emphysematous area covered lower jaw. On the third day the abdomen was so swollen that ribs and pelvic bones could not be felt. On the sixth day it had all disappeared. Died three years later of contracted kidney.

Gilles: *Toulouse med.*, 1906, 2. s., viii, 138.

Primipara aged thirty, three hours in her second stage, normal until, suddenly following a tremendous effort she felt a tearing sensation in the thorax during which some swelling progressively spread over neck and face. In few minutes she was of monstrous aspect and hardly recognizable and lost her voice. Swelling was especially marked at base and lateral aspect of neck, along large vessels, under chin, eyelids, cheeks, and in front of ears. Skin over these areas showed singular pallor. Air crepitation there. Forceps used as air reached the base of chest. Placenta easily expressed. Emphysema was absorbed rapidly and next day face was normal. Photograph was taken twenty-four hours later (not found in this journal, however). Aphonia and slight impediment in swallowing had not disappeared. Her general condition was always excellent. Never had any respiratory trouble. Lungs had never been anything but negative.

Siegelstein, M. J.: *Jour. Am. Med. Assn.*, Chicago, 1911, lvii, 285.

Primipara, aged twenty, with a vaginal septum $\frac{1}{4}$ inch thick extending from just below the urinary meatus to the fourchette. She was admitted in labor with a three finger cervix, unruptured membranes, and head engaged in right occipito-anterior position. Seven hours later the membranes ruptured, pains became more

frequent, and, as the vertex was dilating the introitus, she made excessive efforts to overcome this obstruction. While straining, a swelling suddenly appeared on the right side of her neck and around the angle of the jaw gradually covering that side of the face and completely closing the right eye. When the septum had broken through and delivery was accomplished, the swelling had spread to the root of the neck and upper part of the chest. Crepitation. No redness, pain or tenderness.

Tympany, distant breathing and fine crepitant râles over the swelling. It had all disappeared in ten days.

Cunnington, C. W.: *Lancet*, Lond., 1912, ii, 1012.

Primipara, aged twenty-three, in good health. Thirteen hour labor. During last half hour of the second stage, the pains were "very severe." Fifteen minutes before the head was born, she noticed swelling of the neck. Two hours after the third stage, her face was swollen and cyanosed with eyes almost closed, and the lips swollen and blue. Emphysema extended up to the scalp, all over the neck and chest to the lower ribs, back, and upper arms. Heart or lung sounds could not be heard. No pneumothorax. Temperature 101, pulse 140. Small and weak, respirations 28 and shallow. Slight discomfort in breathing. A week later had only one small patch of crepitation over the third intercostal space near the sternum.

Stocks, M.: *Lancet*, Lond., 1912, i, 722.

Primipara aged twenty, in labor about thirteen hours, vertex, good uterine contractions with strong voluntary efforts. When vertex was just about beginning to make pressure on the perineum, the nurse reported that the patient's face was swelling, and that this increased and was accompanied by cyanosis during the pain. Emphysema extended over the right side of the face. Forceps were applied and a living child delivered. Seven hours later air was present over an area including both sides of the neck, both sides of the face up to the orbital ridges, the whole of the right side of the thorax, limited by the costal margin below, the spine behind, and the sternum in front, the right upper arm to the extent of a third, and the left shoulder. No symptoms except some pain in the chest and at the back of the neck. Good recovery, swelling all disappearing in eight days.

Gilbert, H.: *Australas. Med. Gaz.*, Sydney, 1913, xxxiv, 583.

Primipara, aged twenty-two, in labor twenty-four hours, cervical os the size of a half dollar. Two hours later she was fully dilated with the head well down on the perineum. Four hours later pain "going off," he was called and told that her neck had begun to swell one-half hour before. He applied forceps with vertex crowning and delivered easily a stillborn fetus, weighing seven pounds, two ounces, in the left occipitoanterior position. Her appearance was striking. The curves of the neck were almost obliterated, giving her a curious frog-like aspect. Crepitation was present over a wide area of swelling which involved both sides of the neck, upper eyelids and face including the lobes of the ears, the chest down to the nipples, axillae, and the upper part of the back nearly down to the lower angle of the scapulae. It was more marked on the right side where it had first been noted. Tenderness. No pneumothorax. Frequent short cough and respiratory distress were troublesome for two days. Up to the eighth day all the air had not gone.

Smeed, E.: *Lancet*, Lond., 1914, ii, 445.

Primipara, aged twenty-two, good family and personal history. Normal pelvic measurements with left occipitoanterior position. Two hours after beginning of the second stage, during which the pains had been strong and frequent, swelling of the right side of the neck and face was noticed, completely closing the right eye; slight swelling on the left side. At this time under chloroform anesthesia the head

was delivered by pressure on the fundus. Until the patient was fully anesthetized the emphysema increased on both sides, and spread over the entire sternum, neck and face. No pneumothorax. Air had entirely disappeared on twelfth day.

Murray, J.: *Brit. Med. Jour.*, Lond., 1917, i, 14.

Primipara, aged twenty-four, attended by a midwife, was in labor fourteen hours when he was sent for. On his arrival she presented a most alarming appearance. Her face was scarlet, and swollen to twice its normal size with both eyes completely closed. The upper part of the chest wall, and the neck were also much swollen, soft to the touch, and crackling everywhere on slight pressure. Interference with respiration led the midwife to believe that her patient was dying. Forceps delivery of an abnormally large fetus with a large caput succedaneum. After twenty hours the emphysema had somewhat abated.

Milne, G.: *Brit. Med. Jour.*, Lond., 1917, i, 262.

Primipara, aged twenty-two, normal and healthy showing no sign of disease of heart or lungs. Good pelvic measurements. Labor lasted seventeen hours, of which the first stage occupied fourteen. About an hour before delivery, she felt something go "pop" and swelling of the right eyelid was noticed. After delivery she complained of slight substernal uneasiness, but otherwise felt quite well. Typical crackling felt all over the face except the forehead and chin, over the neck and anterior chest to breasts, and the right side of the back as low as the scapula. No superficial cardiac dullness was present, and the note at the right apex was boxy in character. Breath sounds otherwise quite normal. The air had entirely disappeared within five days.

Good, J.: *Lancet*, 1920, i, 120.

Primipara, aged twenty, "healthy woman with small pelvis and a big child." Labor was much prolonged with head three hours on the perineum. When first seen at this time she complained of sore throat and difficulty in breathing. Lying on her left side with face crowded into the pillow, the right side of her face was much swollen, the eye closed, with swelling extending down face and neck. She was delivered with forceps. The next day her face was uniformly puffed up owing to change of posture; neck distended and swelling extending down over thorax. She had slight cough, but the swelling was everywhere subsiding. Auscultation was unsatisfactory on account of the subcutaneous crackling.

Vermelin, H.: *Bull. Soc. d'obst. et de gynéc. de Par.*, 1921, x, 530.

Primipara, aged nineteen, at term left occipitoposterior position. Cervix fully dilated in fifteen hours and, with strong bearing down pains, the head appeared at the vulva in thirty minutes. All progress then stopped in spite of strong uterine contractions and examination showed a badly flexed incompletely rotated head with large caput on a thick perineum. Forceps extraction of a stillborn fetus. The next day emphysema of the face, neck and upper chest, more marked on left side, was noted. This disappeared in six days.

2. Primipara, aged twenty-two, at term, always well. Membranes ruptured prematurely and first stage of labor lasted fifteen hours. Because of poor uterine contractions in the second stage, two unsuccessful attempts at forceps delivery of a head high in the pelvis were made before admission. Five hours later spontaneous delivery of a stillborn fetus weighing 3700 gm. occurred. The next day marked emphysema of the chest and neck and face to the right parotid region was seen. Febrile convalescence with rapid disappearance of the swelling on the left side, more slowly on the right where first noted.

Riediger, K.: *Zentralbl. f. Gynäk.*, Leipz., 1922, xvi, 1910-1912.

Primipara, aged twenty-five, pleurisy two years before. Eclampsia with two convulsions. Twenty-two hours in labor with strong pains, when first seen. Emphysema present in neck to infraclavicular region; left side of face was more swollen than the right. The swelling increased, almost closing the eyes and crept down the chest a few hours later. Venesection, manual aid, and Smellie-Veit in a breech delivery. Baby alive weighed 3530 gm. Few hours after delivery had pain in face and chest, but swelling did not increase. Disappeared in fourteen days. Examination of chest by internist showed slightly diminished breathing in right apex; no râles. X-ray negative.

Reckitt, J. D. T.: *Lancet*, Lond., 1922, i, 843.

Primipara, aged twenty-two, at eight months, ill for over two weeks with influenza and bronchopneumonia both lungs with high temperature, cough and blood streaked expectoration, weak heart sounds and dyspnea. Delivery of a stillborn fetus by the breech. Two days later his attention was called to a swollen condition of the face and right eyelids. On the next day much worse, right eye being quite closed, with lids enormously swollen; the face, forehead, neck and chest swollen also. Orthopnea urgent and only sitting position in bed tolerated. Next day air spread to both arms, back of hands, abdomen and back. Her condition was grave owing to cardiac weakness and dyspnea. Emphysema much improved but was still present over arms, hands and chest, but had practically disappeared from her face twelve days later. Absorption was complete in two weeks since onset had passed.

Davidson, A. H.: *Irish Jour. Med. Sc.*, Dublin, April, 1923, 79-80.

Primipara, probably, although not stated, aged twenty-one, at term, reached her second stage in twelve hours. Pains during first stage and first part of second stage were normal in force, but as the head (a normal vertex) came down on the perineum patient bore down with frantic efforts to expel it. As the head showed, in a few minutes her face was seen to be markedly swollen, especially about the eyelids so that the eyes were almost closed. No complaint except a little pain about her face and of not being able to see well; swelling extended down to neck and chest. Some tenderness and marked crackling and slight swelling down both arms, all over back, chest and abdomen to the umbilicus. No dyspnea or pain in the chest. Lungs negative. Uneventful recovery with disappearance of all swelling in eight days.

Mittweg: *Zentralbl. f. Gynäk.*, 1923, xlvii, 243-244.

Primipara, aged twenty-one. Four years before had bilateral catarrh of both lung apices. In labor twenty hours with membranes ruptured for one and a half hours, and strong, expulsive pains. Examination showed negative heart and lungs and marked emphysema of both cheeks, chin, upper and lower eyelids, conjunctivae, lower half of forehead, neck, shoulders, extensor surfaces in upper third of both arms, chest to the nipple level and back to the middle of the scapulae. Delivery by forceps under chloroform anesthesia of a vertex in mid pelvic arrest. Baby alive, weighed seven pounds. After delivery the emphysema did not increase and had entirely disappeared in three weeks.

Harvey, D. A.: *Brit. Med. Jour.*, Lond., 1924, i, 1089.

Primipara, young and healthy (age not stated) "with frequent strong pain." Progress being slow, when fully dilated she was delivered with forceps without undue difficulty under chloroform anesthesia; the baby weighed nine pounds and was strong and healthy. Nine hours later her face and neck were found to be swollen. Harvey saw it the next day, and "found the neck and adjacent parts over the clavicles" emphysematous. Absorption took place in one week. No symptoms

are mentioned. The patient could not remember any pain in the chest during her labor.

Hansell, A. W.: *Brit. Med. Jour.*, 1924, ii, 104.

Primipara, young and healthy (age not stated) while having strong and regular pains complained that her right eye was swelling. This swelling gradually increased and extended all around the neck, the upper part of the chest and down the right arm. "Labor was somewhat delayed owing to the presenting part being a face, and it was ultimately terminated with the assistance of forceps." The emphysematous area was tender for several days, but had completely subsided about a week later.

Charbonnet, P. N.: *Surg., Gynec. and Obst.*, 1925, xl, 105-106.

Primipara, aged eighteen, heart and lungs and pelvic measurements normal, in labor at term with blood pressure 240 and edema of feet and face. After labor of about twenty-four hours she was delivered of a nine and a half pound baby with episiotomy, no forceps or anesthetic. A few hours afterward she complained of pain in the neck and difficulty in breathing and swallowing. Emphysema of the interior of the mouth and throat, face, neck and chest to the level of the second rib, was then noted. No discoloration. Temperature and pulse were normal but respirations were slightly labored. Disappeared by eleventh day, anterior chest last.

Oppenheimer, W.: *Monatschr. f. Geburtsh. u. Gynäk.*, 1925, lxx, 243-248.

Primipara, aged twenty-three, never sick, lungs negative, pelvis rhachitic, and slight edema of lower legs. After thirty-four hours in labor, with severe pains, she delivered spontaneously. At the end of the second stage, she had swelling of the upper eyelids, and three hours later, complaining of pain in the neck, a swelling was seen, especially on right side, along jaw to shoulders, whole face and chest to nipple level. This receded slowly but was still present over clavicles on eighth day. No dyspnea, tachycardia or cyanosis. Internist reported lungs negative except for diminished breathing on left side posteriorly. X-ray showed perfectly normal lungs.

Lauritzen, A. G.: *Ugesk. f. Læger.*, Kjøbenhavn, 1925, lxxxvii, 938.

Primipara, aged twenty-one, normal measurements, in labor fifteen hours with a 4 cm. cervix and head firmly engaged. Three hours later found cervix obliterated, patient with very strong pains at three minute intervals. Face was swollen; breathing painful; dysphagia; stiffness of neck; talked with difficulty. Swelling increased with every pain. By time birth occurred one half hour later, patient was unrecognizable, head and neck enormously swollen, eyes closed. Face pale. Cardiac dulness had disappeared, heart sounds were distant and mediastinal emphysema was demonstrable. Lungs negative. In a few days normal heart dulness returned. Emphysema disappearing entirely in seven to eight days.

All the cases reported have been studied with the hope of reaching definite conclusions as to the factors concerned in the production of this very interesting phenomenon.

In determining what may be termed predisposing causes, we find the lesion occurring in all but a few cases in primiparae. Although seen in women with definite pulmonary lesion such as pneumonia or tuberculosis, it has been most commonly observed in robust young primiparae where no evidence of any lesion could be found.

The bearing down effort seems to occupy a definite place in its etiology, even though many cases have had a relatively easy delivery.

Dystocia, however, is common and most cases have had long labor. Disproportion, dry labor, rigid soft parts, poor positions of the vertex, and a slowly dilating cervix are commonly reported. Usually observed during the second stage of labor, it may occur in the first and frequently is not noted until the delivery has been completed.

Its rarity alone would seem to indicate that the simple physiologic effort of parturition is not sufficient, and yet it does not follow that there must be a predisposing cause. If we say that air gains access to the cellular tissue through a solution in continuity of the respiratory tract,—and no other hypothesis is possible, the break may occur at any point, where there may be a lesion, or even in normal tissue, where other factors of stress are adequate.

There has been much speculation on the mechanism of its production. Only clinical deduction may be made, as very little experimental research has been done. Only two cases died, de la Salle's and de Paul's (Kosmak), the one coming to autopsy showing a rupture of the pulmonary alveoli with air beneath the pleura, but no emphysema of the cellular tissues.

With the deep inspiration accompanying labor pains, a large volume of air is stored in the lungs; the chest is fixed and the thoracic cavity narrowed; the force will act then entirely on the contained organs and the parenchyma, which normally meets no resistance, will give way. If the force continues to act, the air passes under the pleura to the root of the lung, opening an easy path through the sheaths of the great vessels, infiltrating the mediastinum and following the vessels of the trachea into the neck, from where, with but little resistance, it finds its way through the cellular tissues. Pneumothorax has not been observed in any case. Nicaise showed that, during loud cries, the trachea dilates almost to the point of rupture, and believes this to be the essential lesion. Notwithstanding the cartilaginous strength of the trachea, posterior hernia of its mucosa has been observed, and rupture of the trachea with subsequent emphysema has been seen in whooping-cough.

Watson had no difficulty in infiltrating the submucous tissues of the face, neck and chest and the submucous tissue of the mouth and throat by the injection of air through a wound of the buccal mucosa.

The ease with which fractures of the lacrimal bone takes place, and its not uncommon occurrence with only slight effort, has led some observers to believe that the point of rupture is here or along the course of the tear duct. Although rupture of the air passages anywhere would permit the air to ascend, there is much anatomic evidence to show that air enters the tissues in this way in conditions other than parturition—and from very slight effort.

Diagnosis offers no difficulties. Swelling which at first may be mistaken for edema shows the characteristic crackling or air crepitation

(*Schneeballknirschen*). Redness, cyanosis or pallor are infrequently present. Appearing first in the neck or face, spreading to the chest and back, often the arms, and less frequently the abdomen and entire body, the patient presents a typical, often grotesque appearance. There is more or less discomfort or pain in the affected area, and occasionally the patient has felt something burst or tear in the neck. Dysphagia, hoarseness and aphonia have been observed. Cough and dyspnea are common and occasionally the patient's cardiac and respiratory distress are alarming. Acceleration of the pulse is common, but one case showed marked bradycardia. Mediastinal emphysema may be demonstrated.

Treatment is expectant. Rapid delivery, however, is indicated for steadily spreading emphysema, or symptoms of respiratory distress.

SUMMARY

1. Subcutaneous emphysema is a broad term for a rare complication of labor which needs further classification.
2. Respiratory emphysema of labor is suggested as descriptive of the form studied here.
3. Its etiology and pathology are not definitely known, but it may originate in any part of the air passages.
4. Its prognosis is generally good, and its treatment obvious.
5. One hundred and thirty cases are now available for study and the appended bibliography, with the abstracted cases above, includes all the references except textbooks.

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BY HOWARD B. GOODRICH, M.D., HANNIBAL, MO.

Name	Address				Telephone							
Age	Sex	M	W	F	Year	Origin, Race, Nationality	Occupation					
Referred by					Provider							
Family History					Leveretted							
Previous Medical					F. (Inches)							
Illnesses (Surgical)					Bowel							
Menses												
Labor												
Abortion												
Last Menstruation	Day	Month	Year	Days	Conception	Day	Month	Year	Confinement day	Day	Month	Year
Development	Height		Inches		Heart	Symptoms in females		Cm				
Average Weight	In		Hemoglobin		Lungs		Interpubic diameter		Cm			
Teeth	Thyroid		Breasts		Intervulval diameter		Cm					
Tambs	X		Abdomen		External Conjugate		Cm					
Pelvic Floor							Cervix					
Thickness of Bones				Pubic Arch		Coccyx		Ischial Spines				Cm
Inclination of Symphysis				Depth of Symphysis		Cm		Transverse Diameter of Outlet				Cm
Promontory of Sacrum				Diagonal Conjugate		Cm		Antero-Posterior Diameter of Outlet				Cm
Inclination of Sacrum				True Conjugate		Cm		Posterior Sagittal Diameter of Outlet				Cm
Remarks												
Expert Labor												Cm

[illegible]

*This card may be obtained at the Standard Printing Company, Hannibal, Mo.
It measures 5 by 8 inches.

as well as for special items and a conclusion in regard to the general condition, type of pelvis, and prognosis. There is no attempt made to allow for detailed descriptions of the puerperal and neonatal periods as they seem to us to be unnecessary, particularly for hospital deliveries. The space, "Result," however, is intended for the mention of any particular event or abnormality of either the puerperal or neonatal period as well as for noting the condition of the mother and baby on discharge.

PROPHYLACTIC EXTERNAL VERSION*

By R. A. BARTHOLOMEW, M.D., ATLANTA, GA.

PROPHYLACTIC external version, which may be defined as the conversion of a less favorable into a more favorable presentation by external manipulation, is a much neglected phase of prenatal care. Considering its importance, there has been comparatively little written on the subject. The contributions in the literature are mainly from French, German, and Dutch sources; some few articles have been published by English, Cuban, and American writers.

The procedure is highly recommended by the majority of authors. Objections are offered by Miller¹ on the ground that cephalic version in the last two months of pregnancy is a trying and unsatisfactory procedure; that anesthesia is usually necessary; that there is grave danger of precipitating premature labor and premature separation of the placenta, and finally that there is no place for cephalic version since breech deliveries are so easily handled and are of so little danger to mother and child. Percy² believes that the cases in which the operation can be made a practical aid are very infrequent. Marx³ states that there is only an extremely limited field open to external version. As will be seen from the available statistics and the results obtained in the cases here reported, the above objections cannot be sustained.

The history of external version dates back to the publication of an article by Wigand in the *Hamburg Magazine* in 1807, emphasizing the many advantages of the procedure. According to Meyer,⁴ however, Wigand limited its application to oblique and transverse presentations, and the credit for extending the indication to breech presentation belongs to the French obstetrician, Mattei. Pinard did much to popularize the operation in France. Modern textbooks on obstetrics, while recognizing the value of the maneuver, apparently do not emphasize its importance as a part of prenatal care, and as a factor in reducing fetal mortality and morbidity.

Prophylactic external version usually refers to the conversion of a breech or transverse into a cephalic presentation. Kraus⁵ uses the

*Read, by invitation, at the Fifty-second Annual Meeting of the American Gynecological Society, Hot Springs, Va., May 23-25, 1927.

term in the opposite sense, and in cases presenting pelvic contraction he converts the cephalic into a breech presentation, thereby hoping to deliver the aftercoming head easier than the forecoming. He quotes Schauta, Bumm, and Wolf in support of the use of the term in this sense. The use of the procedure in this way is not generally sanctioned.

The importance of external version lies in the fact that by means of this simple maneuver, the great majority of breech presentations may be eliminated, thus preventing the high fetal mortality and morbidity resulting from breech deliveries.

It is now recognized that the trauma incident to the supposed necessary rapid extraction causes far greater fetal mortality and morbidity than asphyxia.

Pierson⁶ found that natal or neonatal death occurred in 18, or 12 per cent, of 142 primary breech deliveries, while in a series of 87 version and breech deliveries of viable babies, natal or neonatal death occurred in 18, or 26 per cent. In these 36 cases, spinal cord hemorrhage was noted in 17, or 47 per cent; fractured vertebrae in 14, or 38 per cent; intracranial hemorrhage in 44 per cent; hemorrhage in the spinal canal in 47 per cent; complete rupture of the spinal cord in two cases, and partial rupture in two cases. Trauma was the probable cause of death in 50 per cent of the 36 cases; asphyxia alone in 5 per cent; trauma and asphyxia together in 39 per cent. Fifty per cent of the mothers were primiparae. Pierson quotes similar and convincing reports from other authors.

If we accept 3 per cent as the average incidence and 10 to 15 per cent as a conservative estimate of the fetal mortality of viable breech deliveries, as compared to 2 or 3 per cent in cephalic deliveries, the importance of preventing breech presentations is at once appreciated.

From the standpoint of the mother, the tendency to longer labor, premature rupture of the membranes and increased cervical and perineal lacerations is further reason for preventing breech deliveries. Finally, the physician is spared the increased responsibility and time involved in the conduct of breech deliveries.

The subject of external version should be considered from the standpoint of its indications and contraindications, the stage of pregnancy during which it is advisable to be used; the objections or possible dangers to mother and baby; the technic and finally the results obtained, based on the available statistics.

J. Rietdijk⁷ reports 356 attempted external versions in 372 cases diagnosed as breech presentations, occurring in the Rotterdam School of Midwifery from 1907 to 1916. Version was successful in 317 cases of which 271 cases were delivered in the clinic. The presentation at birth was cephalic in all but two of these. Of the 39 failures, 25 were confined in the clinic; the presentation was cephalic in 11, and breech in 14 of these cases. Of the 11 cephalic presentations, 8 were

turned before the thirty-second week and 3 from the thirty-second to the thirty-eighth week. All breech presentations failing to be turned after the thirty-sixth week, remained breech. Two breech deliveries occurred even though the version had been successful. In each of 3 cases, version was required three times before the presentation remained cephalic. There were 12 neonatal deaths, none of which could be definitely attributed to the preceding external version. Prolapse of the cord occurred in two cases, in both of which the pelvis was flat. There were 28 premature births, all adequately explained by induction of labor for various reasons. Analysis of results according to the stage of pregnancy showed:

- 8 failures in 102 external versions attempted before the 32nd week
- 5 failures in 135 external versions attempted from 32nd to 36th week
- 1 failure in 33 external versions attempted from 36th to 38th week
- 11 failures in 24 external versions attempted after the 38th week

He concludes that external versions are usually unnecessary before the thirty-second week, but should be done before the thirty-eighth week.

Meurer, in the discussion of the above paper, reports 149 breech presentations, 138 of which he turned successfully and delivered in cephalic presentation.

Kouwer⁸ reports 190 attempted external versions from the Utrecht Clinic from 1911 to 1919, of which 174 were successful. Version was impossible in 15 cases, in all of which the baby was nevertheless delivered in cephalic presentation. There was one failure on account of a mistake in diagnosis. Seven babies were born dead, deaths being due to well-established causes in all except one. He strongly recommends the Trendelenburg position as an aid in performing external version and states that success may be had by this method, where version in the horizontal position fails.

Meyer¹ reports 22 cases of breech presentation, successfully corrected by external version. In 8 of these, the version was done in the last week of pregnancy. One baby died due to difficult forceps delivery through a narrow pelvis. Otherwise the version was of no harm to the child. There was no case of prolapse of the cord. He describes the technic employed by Wigand, Schrader, and Hegar as essentially that of disengaging and raising the breech to one side with one, or both hands, if necessary, while the head is then pushed down toward the pelvis on the opposite side with the other hand. He quotes Southwick as disengaging the breech by two fingers inserted in the vagina, pressing the breech up and to one side through the vaginal fornix. This position is retained by the other hand externally after which the version may be accomplished as above described. There are some cases in which external version is impossible without anesthesia. In the Rostock Clinic it is the rule to do an external version each time a breech presentation is found, regardless of the stage of pregnancy. The result is that breech deliveries are very infrequent. Meyer advises the use of pads bandaged on each side of the abdomen to retain the corrected presentation.

Decugniere⁹ recommends the Trendelenburg position as a valuable aid in performing external version, and asserts that many cases can be turned after failure by version attempted in the horizontal position. He credits Fröhlinholz as being the first to suggest the value of the Trendelenburg position in external version (1904); Levy-Solal,¹⁰ De Lec²⁶ and Pollock¹¹ have further emphasized its value. Decugniere divides the technic into three steps: (1) mobilization of the breech by carrying the fingers under the breech and slipping it into the iliac fossa corresponding to the side of the fetal back; (2) mobilizing the head which usually becomes accessible from under the ribs following the movement of the breech, and (3) turning the fetus in the direction which will correspond to flexion. The new position is maintained by means of pads and bandage. He recommends that version be practiced not earlier than the end of the eighth or the beginning of the ninth month. It is always a useless procedure before the eighth month. In a total of 61

versions accomplished in the Trendelenburg position, analysis of his results showed 7 failures, but 3 of these were successful on a subsequent attempt. There was a recurrence of breech presentation in 7 cases, 5 of which were multiparae. Analysis of his results with the use of abdominal pads and bandages to maintain the corrected position after version, showed 11 failures in 40 cases. This proportion of recurrence is fully as great as without the bandage, hence the latter is apparently of no advantage in preventing a return to breech presentation after successful version.

Labhardt¹² reports 63, or 35 per cent, successful external versions performed in 185 cases of transverse presentation in the Woman's Hospital, Basel, from April, 1901 to October, 1908. The operation can be done even if the membranes have recently ruptured. The great majority of the patients were multiparae. Prolapse of the cord occurred five times. Forty-four were at term, 19 were premature; 51 versions were cephalic and 12 podalic. The fetal mortality was 6 per cent which is much more favorable than that reported for internal version.

Queirel¹³ also compares internal and external version in the treatment of transverse presentation. In 109 cases of internal version, there were 43 living and 66 dead babies, and four mothers died of uterine rupture. In 18 cases of external version there were 16 living and 2 dead babies. Hence, external version should be used in transverse presentation if possible. External version in breech presentations should be undertaken from the beginning of the eighth month. The corrected position may be maintained by a bandage during pregnancy or by rupture of the membranes at the beginning of labor.

Levy-Solal¹⁰ reports 3 cases turned by the aid of the Trendelenburg position. Potocki, in the discussion of this report, states that when the head will not go down by the shorter way, it may sometimes be made to go down on the opposite side, a point which was found of value in the series of cases here reported.

De Bustamente's¹⁴ technic is very similar to that previously mentioned. He believes external version is unnecessary earlier than the beginning of the eighth month in primiparae and the end of the eighth month in multiparae. It can be done at the beginning of labor in some cases. A podalic external version may be done in case of placenta previa in order to place a foot within reach over the cervix. Hannes¹⁵ does not favor external version for placenta previa.

Kitzing¹⁶ favors external version for transverse and breech presentations during the last few weeks of pregnancy and early in labor, but states that the new position must be maintained with a binder and properly fitting pads. Gardner¹⁷ states: "The difficulties of the operation have been exaggerated and its advantages, especially those to the child, have been belittled." Horn¹⁸ says: "The neglect of cephalic version is typical of the history of medicine, in which discoveries are made popular, are for a time forgotten and are then resurrected and their proper limitations established." He attempted external version in 23 cases of which 20, or 87 per cent, were successful and 3 cases unsuccessful. Version was repeated in some cases.

Brodhead¹⁹ believes there is but one danger in external version,—that of prolapse of the cord. The advantages far outweigh the disadvantages. The head should be pushed down on the side opposite that on which the back rests, flexion of the head being preserved in this way. The child can then be kept in the correct position with pads and binder.

Pollock¹¹ reports 16 successful cases, the version being done from the twenty-eighth week to the thirty-eighth week. Chloroform anesthesia was necessary in 7 cases. Roland²⁰ discusses the indications and contraindications to external version and states that the most favorable time is at the beginning of the ninth month at which stage the fetus is still sufficiently movable and the new position more stable. Loviot²¹ suggests that a left cephalic presentation may be changed to

a right, by an intermediate transformation to breech presentation,—in other words, a double external version. It is doubtful if many would subscribe to this unnecessary and excessive turning.

Grad,²² in concluding a report of a case of successful external version states: "If we make attempts in these cases, to do version and carefully watch them

TABLE I
ATTEMPTED EXTERNAL VERSIONS

CASE	PARA	FIRST ATTEMPT	SECOND ATTEMPT	THIRD ATTEMPT	FOURTH ATTEMPT	POSITION IN LABOR
1	0	Failure; 8¼ mo.	Failure; 8½ mo.	Failure; 8¾ mo.		S. L. A.
2	0	Failure; 8¾ mo.				S. L. A.
3	0	Success; 8½ mo.				R. O. A.
4	2	Failure; 8½ mo.	Failure; 8¾ mo.			S. L. A.
5	0	Failure; 9 mo.	Failure; 9 mo.			S. L. A.
6	0	Failure; 8 mo.	Success; 8¾ mo.			O. L. A.
7	0	Success; 8 mo.				O. L. A.
8	2	Success; 7 mo.				O. L. A.
9	0	Failure; 7½ mo.	Spont.; 8 mo.			O. L. A.
10	1	Success; 7½ mo.	Success; 8½ mo.	Success; 8¾ mo.		O. L. A.
11	3	Failure; 7½ mo.	Failure; 8 mo.	Failure; 8½ mo.		S. L. A.
12	0	Failure; 6¾ mo.	Success; 7 mo.			O. L. A.
13	1	Success; 7 mo.				O. L. A.
14	1	Success; 7 mo.				O. L. A.
15	2	Success; 7 mo.	Success; 7½ mo.	Success; 8 mo.	Spont.; 8¼ mo.	R. O. A.
16	2	Success; 6½ mo.				R. O. A.
17	3	Success; 8½ mo.				O. L. A.
18	1	Success; 7½ mo.				O. L. P.
19	3	Success; 8 mo.				O. L. A.
20	0	Failure; 7¼ mo.	Spont.; 7¾ mo.			O. L. A.
21	1	Success; 7½ mo.				O. L. A.
22	0	Success; 8 mo.				O. L. A.
23	1	Success; 6¾ mo.	Success; 7 mo.	Success; 8 mo.		R. O. A.
24	0	Success; 6¾ mo.				O. L. P.
25	1	Failure; 6½ mo.	Spont.; 7½ mo.			O. L. A.
26	1	Success; 7½ mo.				O. L. A.
27	2	Success; 6¾ mo.				R. O. P.

TABLE I—Cont'd.

ATTEMPTED EXTERNAL VERSIONS

CASE	PARA	FIRST ATTEMPT	SECOND ATTEMPT	THIRD ATTEMPT	FOURTH ATTEMPT	POSITION IN LABOR
28	0	Failure; 7 $\frac{3}{4}$ mo.	8 mo.	Failure; 8 $\frac{1}{4}$ mo.	Failure; 8 $\frac{1}{2}$ and 9 mo.	R. S. A.
29	0	Failure; 6 $\frac{3}{4}$ mo.	Spont.; 7 $\frac{1}{4}$ mo.	Success; 7 $\frac{1}{2}$ mo.		O. L. A.
30	4	Success; 6 mo.	Failure;			O. L. A.
31	1	Failure; 6 $\frac{1}{2}$ mo.	Spont.; 7 mo.			O. L. A.
32	0	Success; 6 $\frac{3}{4}$ mo.				O. L. P.
33	1	Success; 7 mo.				S. L. A.
34	1	Success; 7 mo.	Success; 7 $\frac{3}{4}$ mo.			O. L. P.
35	1	Success; 7 mo.				R. O. A.
36	1	Success; 6 $\frac{3}{4}$ mo.				O. L. A.
37	2	Success; 8 mo.				R. O. A.
38	1	Success; 7 mo.				O. L. A.
39	0	Success; 8 $\frac{3}{4}$ mo.				O. L. P.
40	0	Success; 9 mo.				O. L. A.
41	0	Success; 7 mo.				R. O. P.
42	0	Success; 7 mo.				R. O. P.
43	1	Success; 7 mo.				R. O. A.
44	1	Failure; 7 mo.	Spont.; 7 $\frac{1}{2}$ mo.			R. O. A.
45	0	Success; 7 mo.				O. L. A.
46	0	Failure; 7 mo.	Failure; 7 $\frac{1}{2}$ mo.	Failure; 8 mo.		O. L. P.
47	0	Success; 7 $\frac{1}{4}$ mo.				O. L. A.
48	2	Success; 7 $\frac{3}{4}$ mo.				O. L. A.
49	0	Success; 7 mo.				O. L. A.
50	0	Success; 7 mo.	Success; 7 $\frac{3}{4}$ mo.	Success; 8 $\frac{1}{4}$ mo.		O. L. A.
51	0	Success; 7 mo.	Success; 7 $\frac{1}{2}$ mo.			O. L. A.
52	2	Success; 7 $\frac{1}{4}$ mo.				R. O. P.
53	1	Success; 7 mo.				O. L. A.
54	0	Success; 8 mo.	Success; 9 mo.			R. O. A.

month after month, in a certain number of cases we can accomplish it with very good results as far as the life of the baby is concerned."

King²³ describes a postural method of correcting transverse presentation, which depends on the pressure of the thighs on the fetus when the patient is made to assume a squatting posture.

Starke²⁴ reports a case of successful external version and in conclusion states: "I would recommend to all medical men having the advancement of their profession at heart, in all doubtful cases and when possible, to examine their pregnant patients a week or so before their expected confinement, for the ascertaining and correction of presentations, the same as we recommend to examine their urine for albumin to prevent complications."

Ryder²⁵ reports that 30 women on whom external version was performed in none of the primiparae did the fetus turn back to its original position; although this did occur in several of the multiparae, and necessitated another version. Several external versions were done under ether anesthesia. There was no injury to the mother in any case. One patient had slight bleeding following the version. There were four failures. The technic employed was essentially that of the authors previously mentioned. He does not regard bandages as of sufficient value to be used. There were 5 cases in which the cord was found around the neck.

In the series here reported from my practice there were 54 patients who were found to have breech presentation on one or more examinations made from the end of the seventh month to full term. These 54 cases occurred in 455 consecutive patients, excluding those having a condition which contraindicated external version. Table I is a brief summary of each case.

There were 81 attempted external versions in the 54 cases. The first attempt was successful in 49 cases; 4 were turned after one or more attempts, making 53, or approximately two-thirds successful versions, and 28, or approximately one-third failures. However, in 6 of the 28 failures, the baby turned spontaneously before reaching full term.

There were 7 cases delivered as breech. Based on the average incidence, there should be approximately 15 breech presentations in a series of 455 deliveries, hence the frequency was reduced 50 per cent by external version. This is in the series as a whole. It will be noted that most of the breech deliveries occurred in the first part of the series. If we consider the results obtained after more experience with the method, it is found that during the past three years, of 37 cases of breech presentation from the stage of viability on to full term, there were only 2 delivered as breech. One of these (Case 33) was a premature delivery, the version having been successful at seven months, but the baby returning to breech presentation just before labor came on at eight months. On account of the interval between the attempted version and the labor, it is doubtful whether the version was a causative factor. The other (Case 28) could not be turned even under anesthesia, apparently because of the fact that two previous attacks of suppurative appendicitis had produced a very large, dense scar in the lower right quadrant, which greatly interfered with palpation. On the basis of 345 full-term deliveries during this period, one would expect at least 10 breech deliveries; hence the frequency of breech delivery was reduced 80 per cent.

Analysis, according to the month in which version was attempted or spontaneous, showed one case in the sixth month which was successful; 29 cases in the seventh month, of which 76 per cent were successful, 20 per cent failed, and 4 per cent turned spontaneously; 34 cases in the eighth month, of which 62 per cent were successful, 23 per cent failed, and 15 per cent turned spontaneously; 24 cases in the ninth month, of which 46 per cent were successful, 50 per cent failed, and 4 per cent turned spontaneously. The low percentage of spontaneous versions and high percentage of failures in the seventh month are probably due to the fact that the routine abdominal examinations were not begun until near the end of the seventh month. It is apparent, therefore, that external version is successful in 76 per cent of the attempts made in the seventh, 62 per cent in the eighth, and 46 per cent in the ninth month. The version is ultimately successful, however, if repeated attempts are made, as is evident by the great reduction in the frequency of breech deliveries. The frequency of spontaneous version decreases rapidly as the patient approaches full term.

The cases were also analyzed according to parity. There were 25 primiparae and 29 multiparae. Version was successful in 23 of 42 attempts, or 53 per cent, in primiparae. It was necessary to repeat the version in 4 of these cases. There were 3 cases of spontaneous version in the 19 failures. Version was successful in 31 of 39 attempts, or 80 per cent, in multiparae. It was necessary to repeat version in 4 of these cases. There were 5 spontaneous versions in the 8 failures.

One version was sufficient in the majority of cases. In 3 cases version was performed twice, and in 4 cases, three of these being multiparae, it was performed three times.

Spontaneous version often occurs after failure to perform external version. There were two cases of spontaneous version in the seventh month, one a primipara and one a multipara. This number would probably have been much greater, had not the observations been limited to the latter part of the seventh month. There were 5 cases in the eighth month, of which 3 were primiparae and 2 multiparae. There were no cases in the ninth month.

In addition to the points in the technic previously mentioned, note was made as to whether the baby was turned in the direction of the forehead (flexion) or the occiput (extension) as the advancing part. In 3 cases the initial attempt to turn the baby in the direction of the occiput was successful. In 5 cases this method was successful where the initial attempt in the direction of the forehead had failed. In 25 cases the initial attempt to turn the baby in the direction of the forehead was successful. In 8 cases this method was successful where the initial attempt in the direction of the occiput had failed. In 12

cases both methods failed. Even though turning is done in a direction which favors extension, there is no tendency for extension to complicate labor, which has heretofore been emphasized as a possible danger. Turning in this direction is less often successful than in the reverse direction, probably due to the fact that tendency to extension of the lower limbs is favored. The Trendelenburg position was not used in any case in this series.

Ether anesthesia was used in two cases in which version failed several times. In Case 28, it was impossible to turn the baby, even with the aid of two fingers in the vagina pressing the breech up and to one side through the vaginal fornix. The excessive scar tissue in the lower right abdomen apparently was the obstacle in this case. In Case 46, the turning was easily accomplished under the anesthetic.

Case 50 was of more than ordinary interest. This patient showed typical uterus didelphys, with complete duplication of the uterus, cervix, and vagina. The pregnancy was in the uterus on the right, the other uterus being moderately enlarged and lying somewhat to the left and posterior. External version was of great aid in preserving a cephalic presentation and determining whether the head would pass the obstruction offered by the nonpregnant uterus. The test was much safer with a forecoming than with an aftercoming head.

There was very little discomfort during or after the version. Bleeding did not occur in any case, and there was no prolapse of the cord or small parts. Coiling of the cord about the neck was noted in 40 per cent of the cases of attempted versions and in 37 per cent of the other cases, delivered over this same period. There was no fetal mortality in the series, and no premature rupture of the membranes or premature separation of the placenta. There was no case of premature labor which could be attributed to the version.

No attempt was made to retain the corrected position by abdominal pads and bandages. Analysis of statistics, previously mentioned, shows that fully as many babies revert to breech presentation with, as without, the use of the bandage.

SUMMARY

The principal indication for prophylactic external version is the discovery of a breech or transverse presentation during the latter part of pregnancy. According to some authors, it is indicated in placenta previa in order to make the foot more accessible for controlling the hemorrhage.

The contraindications to external version upon which most authors agree are multiple pregnancy, marked pelvic contraction, dead fetus, previous cesarean scar, threatened uterine rupture, hydramnios, oligohydramnios, premature separation of the placenta, and the onset of

labor. Other conditions which may contraindicate external version are placenta previa, bicornuate uterus, and eclampsia.

The objections to external version and possible dangers associated with it, are that improper version may be done through a mistake in diagnosis, thus converting a cephalic into a breech presentation; prolapse of the cord or small parts may occur; the cord may become coiled about the neck more frequently; the uterus may rupture; the membranes may rupture prematurely; premature delivery may be brought on; the position is not permanent; the operation is difficult; breech deliveries present no serious danger or difficulty; and finally, separation of the placenta may occur. The statistics and results bearing on these points, both from other authors and from the series of cases reported, do not sustain these objections.

The most favorable stage of pregnancy to attempt external version is during the eighth month. From the end of the seventh month, on to full term, abdominal examinations should be made at least every two weeks to discover breech or transverse presentations and convert them to cephalic by external version. If repeated attempts are unsuccessful, the version can usually be done under anesthesia. The turning is increasingly difficult as full term approaches, more so in primiparae than in multiparae.

The essential points in the technic are to raise the patient's head and shoulders somewhat and flex the thighs in order to obtain as much relaxation of the abdominal muscles as possible; the bladder should be emptied; all manipulations should be carried out as gently as possible, and there must be an accurate preliminary diagnosis of the presentation and position. The breech is first raised from the pelvis, with both hands if necessary, and carried toward the iliac fossa on the side opposite to that on which the head is to be brought down; the head is then pushed down toward the pelvis with one hand while the breech is pushed up toward the fundus with the other hand by very gradual, intermittent pressure. As a rule, it will be found easier to make the forehead advance, rather than the occiput. If the breech is fixed in the pelvis, it may be disengaged by the aid of the Trendelenburg position or by pressure with two fingers inserted in the vagina. It is not necessary to use a bandage to attempt to retain the corrected presentation, as even with the bandage, the version may have to be repeated one or more times before labor.

The results of routine external version in the last two months of pregnancy show that it is a harmless procedure for both mother and baby, and by means of this simple maneuver from 80 to 90 per cent of breech presentations may be prevented with a corresponding reduction in the fetal mortality and morbidity which attend breech deliveries.

CONCLUSIONS

1. Breech deliveries should be prevented on account of the resulting increase in fetal mortality and morbidity.
2. The frequency of breech deliveries may be reduced from 80 to 90 per cent by the routine practice of external version during the last two months of pregnancy. Anesthesia is rarely necessary.
3. External version has no apparent harmful effect on the mother or baby during pregnancy or labor.
4. The turning is usually easy to perform and may be tried either in the direction of flexion or extension of the fetus, the former, as a rule, being more successful.
5. The version may have to be repeated one or more times before the presentation remains cephalic. Abdominal pads and bandages are apparently of little value in preventing a return to breech presentation.
6. External version should be given greater emphasis as an essential part of prenatal care.

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CLINICAL SIGNS OF FETAL DISTRESS DURING LABOR*

BY FREDERICK C. FREED, M.D., NEW YORK, N. Y.

(From the Department of Obstetrics, the University and Bellevue Hospital Medical College)

THIS study, begun about two years ago, was undertaken to determine what relationship exists between changes in the fetal heart sounds and threatened asphyxia, especially during the latter part of labor.

The subject proved so interesting and enlightening that I decided to go a little more deeply into the question, and so have incorporated certain historical data concerning the fetal heart sounds and the funic souffle, and also the significance of meconium in the amniotic fluid.

From a careful study of five hundred cases, personally observed at Bellevue Hospital and the Manhattan Maternity Hospital, in private practice, and in other institutions, I have selected those in which there was a noticeable deviation from the accepted normal fetal heart rate of from 120 to 160, taken during intervals between uterine contractions. Many cases had to be omitted because of insufficient observation, so that the cases discussed include only those in which complete data was obtained.

In addition to these cases a small number were observed in which no change from the normal fetal heart sounds were noted and yet babies were stillborn or died soon after birth.

Among those cases showing a deviation from the normal heart rate, an attempt was made to show the relationship between the condition of the baby at birth and the frequency of the heart sounds, also positive or negative Wassermann reaction, the type of pelvis, the time of rupture of the membranes, the character of uterine contractions, the length of labor, the presence of the funic souffle, the meconium in the amniotic fluid with these variations. Necropsy reports in cases of stillbirths or neonatal deaths, were compared with the clinical findings wherever possible when examining the fetal heart. The use of an elastic band on the stethoscope is of advantage, and, during the second stage of labor a modification of the DeLee stethoscope, or an ordinary stethoscope with an adjustable head band, is comfortable and convenient. A rubber nipple, with the top cut off, placed over the bell of the stethoscope helps to identify and intensify the heart sounds. Pressure on the stethoscope or changing the axis of the bell eliminates the sound of the uterine souffle. The sounds should be recorded for one-half minute because a slight discrepancy in a ten to fifteen seconds

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count makes considerable difference in sixty seconds. The fetal heart often starts at a rapid rate during the beginning of an examination, due to the movements of the fetus, or the beginning of a labor pain, therefore, one should not commence to count the beats until they assume their regular character again. Observations of the fetal heart, I believe, are the best criteria we have of the condition of the child in utero, although accurate conclusions are not always possible.

Very little historical data can be found in the literature until just a few years more than a century ago. In 1818, the fetal heart sounds were first heard by F. I. Mayor, a surgeon practicing in Geneva, but he did not appreciate their importance and his observations did not become widely known. In 1821, Lejumeau de Kergaradec, an obstetrician and an associate of Laennec, also heard the fetal heart beat and the uterine souffle. He used the stethoscope devised by Laennec for the first time. He realized the benefits to be derived from this knowledge and announced his discovery in a memoir presented to the Royal Academy of Science in Paris. Since then many observers have written on the subject. Every Kennedy, a Master at the Rotunda Hospital, described the various locations where the sounds could best be heard, and in 1833 first described the funic murmur, but he erroneously thought that there was a "sympathy" between the maternal and fetal circulation. A few years later he reported four cases with steady slowing and final cessation of the heart sounds after the administration of ergot. The younger Naegele found that the fetal heart rate was decreased by compression on the cranium of the baby at the time of its passage through a narrow pelvis. He also heard the movements of the fetus at earlier periods in pregnancy than it is possible to hear the fetal heart. Frankenhauser found that the age of the fetus caused no difference in the frequency of the pulsations, but that activity of the fetus increased the rate. Killian, of Bonn, said that the most powerful exertions on the part of the mother caused no appreciable acceleration in the rapidity of the fetal heart rate. Hohl's contribution was, that uterine contractions have manifest influence on the fetal heart sounds, and that they are affected by an increased temperature of the mother, but are not affected by venesection, rest and sleep, of the mother. Duval, Kelly, Fischel, Valenta and Fleischman each reported that they had been able to palpate the fetal heart beats through the mother's abdomen. In 1875 James Cummings wrote in his treatise on *The Uterine Souffle and the Fetal Heart*: "When sounds that have been distinct and normal become rapid and weak and then can scarcely be recognized, again, when pulsation becomes slower and weaker and may cease altogether, or when they become irregular and intermittent from irritation or pressure on the brain, we may conclude with tolerable certainty that the child's life is in danger." In spite of these observations, no definite conclusions were drawn or laid down concerning the behavior of the fetal heart in its relation to the vital interest of the child until 1893, when Von Winckel expressed himself definitely. He stated that a rise in the rate of the fetal heart sounds above 160, and a fall of the rate below 100, between uterine contractions, were signs of asphyxia, both of which were indications for the termination of labor. Since then Baum, Seitz, P. Esch, E. Sachs, A. Frey, and Zangemeister have made valuable contributions, but they are not in accord as to the clinical significance of changes in the fetal heart sounds. Intrauterine congenital heart disease has been diagnosed by B. H. Stewart, J. J. Sampson and others by observations of fetal heart sounds. Willkonn suggested using chloroform inhalations, six to eight drops per minute, when the fetal heart rate remains below 100, to decrease the tonus of the uterine and abdominal muscles. In two of my cases of failing

fetal heart, this was used with success. I feel that further investigations which might tend to a better understanding of this important and practical question would be of value.

What we are accustomed to term the "fetal heart," we regard as the transmission of the sound of the heart beat of the fetus to the ear. The sounds are first heard about the middle of pregnancy, though some observers claim to have heard them as early as the third month. These sounds are transmitted through the body of the fetus, amniotic fluid, the uterine and abdominal walls. As in adults, different hearts vary inherently in rate and are affected by various factors, so it is conceivable that the heart beat of one fetus may differ from that of another, and may be modified by different influences. There is no reason to disbelieve that the vagus influence does not pertain in the fetus as in the adult, and so function as the regulator of contractions of the heart. The quality of the tissue of one heart may differ from that of another, and consequently the sounds will not be uniform in strength and rhythm. The rate of a heart may be influenced by its nerve stimulation and the amount of work it has to do in transmitting the varying column of blood, so it follows that intracranial pressure on the vagus center or excess of carbon dioxide in the blood going to the center will decidedly influence the fetal heart rate. The volume of blood going through the heart may be affected by the freedom of flow through the vessels of the umbilical cord, by the permeability of the placental tissue, or by the force of the contractions of the uterine muscle, influencing the capacity of the sinuses of the uterus.

It is easy to comprehend that, if the contractions of the uterus are prolonged and the intervals shortened, especially after the fetal membranes have ruptured, the capacity of the blood carrying sinuses is restricted.

From the physiology of labor we know that as labor advances, the uterine wall thickens and the cavity of the uterus diminishes in area. This change becomes more marked when the membranes rupture. As a result of this physiologic change, the circulation in the placenta is affected, first, by the thickening of the placenta because of its diminished area of attachment; and second, by the pressure on the placenta made by direct contact of the body of the fetus. Following these changes, there is a gradual slowing of the heart toward the end of labor. In the second stage of labor the slowing becomes more noticeable in many cases because, as the body of the child passes out of the uterine cavity, the placenta more and more becomes secondarily affected by the diminished area of the contracting portion of the uterus. Thus, the oxygen supply to the fetus is limited. Therefore, during the last few minutes before birth of the child the heart rate is often much below 100, but as delivery is imminent, little or no harm comes to the baby. The oxygen supply is also limited when the ves-

sels of the umbilical cord are compressed by the body of the fetus. It follows that *vagus* irritation is thus indirectly brought about just as readily as when the medulla is compressed by an existing disproportion between the head and the pelvis, or by a faulty position, or by a constricting cervix or vulva. If this direct pressure does not reach the cardiac center in the brain, the heart will function as before, and the sounds will not be influenced. But, if the respiratory center is involved we have no knowledge of it until the child is born with some degree of asphyxia. Just before paralysis of the cardiac center following compression of the medulla, the heart beat may become very rapid.

Kergeradee's investigations showed that the maternal pulse has no influence on the fetal heart. If the maternal pulse is rapid because of fever, the fetal heart rate will be increased. The temperature of the fetus is at least one degree higher than that of the mother, and the heart beat corresponds to the degree of temperature. As in the case of an adult heart, an elevation of blood pressure makes the heart rate less. In the case of a fetus the blood pressure may be affected by pressure upon the placenta, cord or brain. During a uterine contraction the fetal heart becomes slower, and resumes its normal rate when the pain is over.

Many factors influence the intensity of the fetal heart sounds. Among these are the thickness of the abdominal wall, the quantity of liquor amnii, distention of the bladder, gases in the intestines, uterine contractions, abdominal muscle contractions, the situation of the placenta which is a poor conductor of sounds, and the position of the fetus in relation to the abdominal wall.

Labor itself rarely produces modification of the fetal heart sounds up to the moment of rupturing of the membranes, when they are generally louder and clearer and may be heard over a more considerable area.

Molding of the head during labor is a slow process. One diameter increases at the expense of another, without increasing the contents of the cranium. With increased intracranial pressure, bulging of the fontanelles acts as a safety valve. Because of the great flexibility of the skull, the dura and cerebral cortex are poorly protected from pressure. The cranial sinuses may be pushed aside and distorted by molding of the head, and the stasis so produced will bring about edema of the brain tissue. Under such conditions, the fontanelles will no longer compensate for the increase in the cranial contents. If this pressure reaches the *vagus* center, a slowing of the fetal heart will result. As in an adult, cerebral pressure may either accelerate or slow the heart. Esch was able to produce slowing of the fetal heart beat during pregnancy by sudden firm pressure on the fetal head through the abdominal wall. He also reported slowing of the heart in cases of contracted

pelves, in early or in late rupture of the membranes, and in cases in which increased pressure acted on the skull.

It is quite evident from our knowledge of physiology that if ergot or pituitrin is given, and not followed shortly by delivery, asphyxiated babies may result.

Realizing the futility of a statistic or percentage survey I have selected for discussion only cases that seemed to me to have a direct bearing upon the various factors mentioned before, or those from which some points of clinical importance may be gained. I have, therefore, made no attempt to summarize the cases in series.

In the cases observed, slowing of the fetal heart stood out as the sign of most importance. Interference with the circulation in the cord, due to coils around the neck or the body, was not uncommonly observed as a factor in determining the vitality of the child at birth. Prolonged and frequent contractions of the uterus, with membranes ruptured, was also a noticeable cause both with a disproportion and where none existed. Partial separation of the placenta was noted infrequently; multiple fibroids of the uterus were the cause of altered pulse rate in two cases. Rarely did a cerebral hemorrhage produce slowing of the heart.

In every case, as soon as labor pains are well established, routine observations of the fetal heart should be carried out. The rate should be recorded every fifteen minutes in the first stage, and every five minutes or less in the second stage. It is important to observe the fetal heart tones during the first, as well as the second stage of labor, as in some cases, the fetal heart actually ceased during the first stage, and stillborn babies resulted. Auscultatory observations were made before, during and after uterine contractions, at frequent intervals, in both the first and second stages of labor. Counting the heart rate near the middle of the pause between pains gave the most satisfactory information. In cases where the heart falls below 100, and remains there, we must consider that the child is in danger. If this slowing has been gradual the danger to the child is not so acute as in cases where the change has been sudden. Where the fetal heart goes below 100 following a pain, but during the interval recovers its former rate, it is not evidence of fetal distress. A continuous or sudden slowing of the fetal heart to 100 or less is, on the basis of these observations, an indication for the termination of labor, in the interest of the child. In no case should an operative delivery be carried out, if the accepted conditions for such a procedure are not present. In rare cases, where these changes occur during the first stage of labor, a cesarean section may be safer for both the mother and child. By the use of "prophylactic forceps" in the second stage, we can prevent stillbirths in some cases. The longer the use of forceps is deferred the more likely are we to get a severely asphyxiated or stillborn child. It was proved by

E. Frey in a long series of cases that the longer the heart beat slowed down below 100 between pains, the greater the percentage of dead children. Sachs concluded in his work that where the termination of labor is delayed longer than forty minutes after such a slowing down of the heart, the child usually dies. In some cases, the slowing of the fetal heart was transitory and did not recur and nonasphyxiated babies were born spontaneously. This variance may be explained by compression on the cord by a small part. The administration of chloroform, eight to ten drops per minute, for a period of some ten minutes caused the uterus to relax sufficiently in two of my cases for the heart rate to return to normal from a rate well below 100. In one case chloroform was repeated after an interval. In both instances, spontaneous birth of nonasphyxiated babies resulted. One may resort to the use of chloroform in such a manner while preparing for an operative delivery. It was observed in thirty-six cases where the slowing remained below 100 for some time, that sixteen deliveries were operative, and twenty were spontaneous. Twenty-two of the babies were born in good condition, six had some degree of asphyxia and eight fetuses were stillborn.

In this entire study there were only eight cases in which the fetal heart rate was accelerated above 170, and none of these babies were lost. Two were mildly asphyxiated. The causes of the acceleration I attributed to pneumonia in the mother in one, eclampsia in one, unusual activity of the baby in three and unaccounted for in three.

When there was a fluctuation of the heart rate between the normal accepted rate of 120 to 160, the variations were only temporary and did not seem of significance to the welfare of the baby.

In two cases the heart sounds ceased during labor, without warning. The autopsies accounted for the death in one from intrauterine inspiration and the other from asphyxia caused by the cord being coiled four times about the neck and showing a true knot.

Fresh meconium appeared in twenty-one cases of vertex presentation, and there was no change in the fetal heart below the accepted normal. In seven of these cases the cord was coiled about the neck at least once. The membranes ruptured prematurely in twelve of these. All had spontaneous deliveries and live babies.

In thirty-five cases in which the cord murmur was heard during both the first and second stages of labor, it was found to be coiled about the neck at birth in every instance. Three of these cases resulted in stillbirths, in four the babies were severely asphyxiated, but resuscitated, and in ten there was mild asphyxia. In ten others where the cord was loosely around the neck no murmur was heard and asphyxia was not present in any of them.

In no instance did syphilis or a positive Wassermann reaction influence the fetal heart rate unless it was in one case that had had two

previous stillbirths. This time the labor was short and the fetal heart was slowed for one hour. A cesarean section was done, but a stillbirth resulted, the autopsy showing cerebral hemorrhage and syphilis. The syphilis may have been a factor in causing the hemorrhage and resultant slowing of the heart.

The length of the first stage of labor rarely showed marked influence in alteration of the fetal heart rate. In cases where there was any alteration there had been, almost invariably, either premature rupture of the membranes or unusually strong pain or a disproportion between the pelvis and the fetus.

The length of the second stage of labor seems to have been a factor in a number of cases, in causing the heart rhythm to depart from the normal.

It was also noted that the heart rate of the baby following birth varied from 60 to 110, but that after the baby cried or moved its arms and legs, the rate increased immediately to between 170 and 220, and at the end of ten minutes decreased again to between 120 and 140. This change occurred within lesser limits when the uterus was vigorously palpated and the movements of the child stimulated before delivery.

When the caput is on the perineum and spasmodic, irregular or regular movements can be seen, asphyxia is present. It is accompanied by a very slow fetal heart. In one of my cases showing this phenomenon, the fetus was severely asphyxiated, and in another it was stillborn. These movements are due to efforts of the fetus to breathe and is a demand for oxygen.

RÉSUMÉ

Fetal heart sounds, being the direct transmission of the sounds from the heart of the fetus, will usually give first hand information of the condition of the fetus, and indicate whether or not the child in utero is broadcasting signals of distress. Careful "listening in" is obligatory to the conscientious obstetrician, and should be done from early in labor until the child is born. This is especially necessary in elderly primiparae, in cases of a "questionable" pelvis, and in cases having frequent strong contractions, or where fetal membranes have ruptured prematurely, and in cases of breech presentation.

A fetal heart remaining below 100 between pains is a very real sign of distress, and either calls for extremely careful observation and investigation, or the termination of labor if this can be done with safety to the mother.

A funic souffle persistently heard, usually indicates a cord around the neck, or pressure on the cord, and is an extremely valuable sign to the observant obstetrician as indicating possible danger to the fetus.

The appearance of meconium is not per se of the vital importance

that some suppose, but the presence of meconium with a slowed fetal heart is an added indication for interference.

A rapid fetal heart is usually not of serious import, nor is a fetal heart that fluctuates or varies, provided it is within the usual normal range.

Occasionally, however, a child may be born dead, and the fetal heart show no indication of the impending asphyxia even when carefully observed all during labor. Such deaths are usually due to some form of cerebral injury, involving the respiratory center.

Syphilis has not been found to be a factor in influencing the rate of the fetal heart during labor.

A small pelvis, early rupture of the membranes, or frequent strong uterine contractions have a marked effect in slowing the fetal heart, especially if any of these conditions are combined.

Prolongation of labor during the first stage influences the heart rate of the fetus very little, but during the second stage the effect is much more marked and frequent. Changes in the rate of the fetal heart occur more commonly in the second stage of labor, therefore, more frequent observations during this period are essential.

The administration of chloroform in the manner suggested, while making ready for the delivery, may help save some of these babies.

At birth, the heart rate of the baby becomes quite slow and quickly rises after a few inspirations to gradually return to the usual quickened rate of the newborn child.

Forceps deliveries per se, in competent hands, do not add to the hazard of the baby. On the contrary, in many instances when a changed rate of the fetal heart has warned of danger, a timely and judicious delivery by forceps will enable us to reduce our present persisting ratio of stillborn babies.

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59 EAST FIFTY-FOURTH STREET.

(For discussion, see p. 681.)

Society Transactions

AMERICAN GYNECOLOGICAL SOCIETY

FIFTY-SECOND ANNUAL MEETING

Hot Springs, Va., May 23, 24 and 25, 1927.

The scientific sessions included the following papers with abstracts of the discussions:

DR. REUBEN PETERSON, Ann Arbor, Michigan, read a paper entitled **Transplantation of the Ureters into the Bowel to Secure Sphincteric Urinary Control in Inoperable Vesicovaginal Fistula.** (For original article see page 492, September issue.)

DISCUSSION

DR. J. WESLEY BOVÉE, WASHINGTON, D. C.—In the *Transactions* of this Society for 1900 Dr. Peterson vigorously condemned ureterointestinal grafting. He now reports having performed the operation for inoperable vesicovaginal fistula, to secure sphincteric urine control. Believing as I do, his objections of 1900 to ureteral grafting into the bowel are overwhelmingly valid, I would exhaust nearly every other resource before resorting to that operation. These alternatives for such exaggerated conditions might be closure of the vagina with the creation of a urethra (if it be absent) by tunnelling, as I did in 1917, or other plastic procedure, or utilizing the body of the uterus to plug the fistulous opening in the vesicovaginal septum, or even creating a new bladder sphincter from the pyramidales (Goebell).

The indications for the many recorded grafts of the ureter into the rectum or sigmoid have been exstrophy of the bladder, cystectomy for primary or secondary cancer, tuberculosis, injuries, exaggerated vesicovaginal fistula, etc. Those of grafting this duct into the small intestine or into the cecum or vermiform appendix have been done usually for injuries high in the course or when a considerable amount of the lower part had to be sacrificed. In my judgment, these grafts should not be preferred to grafts into the bladder or into its fellow or substitution of other material for missing parts of a ureter. In the absence of the bladder only grafts of the intestinal type seem indicated.

* * * * *

Finally, I regard this as a very dangerous operation, having a high primary mortality rate and one very much higher ultimately; one that must be resorted to occasionally but always with great apprehension.

DR. JAMES E. KING, BUFFALO, NEW YORK.—So far as obstetric injuries are concerned, I consider the indications for such a procedure very small. It is perfectly surprising how extensive defects can be closed in one or two sittings by a plastic operation and I should feel that, considering the seriousness of such a procedure as suggested, it would be always desirable to make attempts at plastic closure first.

Some very good statistics in regard to this operative procedure are given by Lower who has had a very considerable experience. He reported 32 cases which

were done for the following indications; 15 for exstrophy, 10 for carcinoma, and 7 miscellaneous conditions. Contrary to Dr. Peterson, from his experience, Lower advises the intraperitoneal method as a much safer and better procedure.

So far as the rectal sphincteric control is concerned he gives very splendid reports, anywhere from three or eight hours during the day and perhaps only one or two voidings at night. He emphasizes one thing which it seems to me we must not overlook in considering sphincteric control, and that is the necessity for a certain education, a certain experience, which the patient acquires, which is essential before sphincteric control becomes very efficient.

This procedure offers a possible field in the cases of cancer of the bladder where the victim is suffering day and night with frequent urination. If the technic of this operation can be brought to a point where the procedure will not be attended by a high mortality it may be possible to give those patients from six months to a year of comparative comfort.

Another indication that might develop would be carcinoma of the cervix where the tumor is encroaching upon the ureters.

DR. BROOKE M. ANSPACH, PHILADELPHIA, PA.—There is no doubt that the indication for transplantation of the ureters into the rectum does occasionally arise. My patient had an extensive vesicovaginal fistula that had been operated upon a number of times. There was great loss of tissue and much cicatricial contraction. The ureteral openings were on the borders of the retracted and fixed remains of the vasovaginal septum. We tried to persuade the patient to have the vagina closed subsequent to the establishment of a permanent communication with the rectum but even after explaining to her the dangers of an alternative operation, she preferred it in order, I think, to continue her marital relations, in deference to the wish of her husband. The implantation of each ureter into the rectum was made on separate occasions, first on the right side. The ureter was divided just above the broad ligament. The technic of Coffey was followed, a small rubber tube being introduced into the ureter and attached there. By this tube the distal end of the ureter was drawn well within the rectum while the distal end of the rubber tube was carried downward through the anus, so that it drained the ureter externally. The patient did very well. At the end of six months the second operation was performed. At that time the right ureter above the point of anastomosis was found to be very much dilated. As this was probably due to contraction of the cut end of the ureter, it appeared desirable to get the entire left ureter with its bladder opening. Accordingly, the uterus was removed in order to give access to the lower part of the ureter, and we succeeded in detaching the entire ureter with its bladder opening, without, however, getting as much of the surrounding bladder mucosa as I would plan to do on another occasion. I transplanted the left ureter into the rectum following the Mayo method of isolating the bowel area with rubber clamps. The ureteral end was kept open with a short rubber tube to the distal end of which a weight was attached to facilitate its detachment later from the ureter and expulsion through the anus.

What I am especially interested in is the fact that although this woman appears to be perfectly well and is very happy with the cessation of the constant flow of urine, works every day and has no bad symptoms, her blood chemistry shows 60 nonprotein nitrogen, about 46 blood urea, and a creatinin of about 1.5. I presume that in spite of our efforts, there is some impairment of the kidney excretory function.

DR. EDWARD A. SCHUMANN, PHILADELPHIA, PA.—In these cases where a transplantation of the ureter seems to offer the only hope of success, I have been considering the propriety of a preliminary low colostomy, thereafter attempting to reduce the bacterial flora of the intestine by germicides and subsequently per-

forming the ureteral transplantation. Closure of the colostomy or its retention as an open channel would naturally be decided upon by the condition of the patient or with regard to evidences of ascending infection. I would like to ask Dr. Peterson and the other gentlemen who have had experience with this operation whether they deem this a proper procedure or not?

DR. FRANKLIN H. MARTIN, CHICAGO, ILLINOIS.—The simplicity of technic in the operation is the secret of success. Dr. Charles Mayo took up this work after he had learned the technic of removing ureteral stones and has had probably the largest number of cases. He found that the less he did after incising the ureter and removing the stone, the more likely the ureters were to heal. When he began implanting the ureters into the rectum he discovered that the greatest success resulted from fewer stitches and a minimum of manipulation.

The method that proved most successful in my work was the placing in the ureter of a very soft rubber catheter, decidedly smaller than the ureter. This was passed down through the rectum and out of the anus so that the urine was practically controlled for the first week of the implantation, and there was opportunity for urinalysis.

DR. PETERSON (closing).—In my paper I endeavored to confine myself to principles and omitted in the reading of the paper the results in the two cases where I transplanted the ureters. In one of these the operation was performed nearly two years ago and so far as I can tell from the examination of the urine removed from the rectum by catheter, the patient is entirely free from kidney infection. The other patient was operated upon less than a year ago. I may say I have never had more grateful patients than these two. Prior to the operation their condition was pitiable. Now they are able to retain the urine and are very happy over it.

In regard to obstetric injuries, I think we all agree with Dr. King that only occasionally do we see cases where it is impossible to close the vesicovaginal fistulas by operative means. However in my particular field of work there are many such cases because other surgeons tried to close these fistulas, and when they failed they were either sent, or the patient drifted to my clinic at the University Hospital.

In my opinion the operation is not applicable to carcinoma of the uterus because the principle upon which the operation is performed is that there shall be no dilatation of the ureters. Where the broad ligaments are involved and the disease has invaded the ureters to such an extent as to indicate transplantation, they are almost invariably dilated. As I have tried to point out in my paper, kidney infection almost invariably follows the transplantation of a dilated ureter. Transplantation in cases of carcinoma of the cervix is contraindicated.

The main thing, as Dr. Martin has said, is simplicity of technic. This is why I do not agree with Dr. Mayo's suggestion that every other stitch should perforate the ureteral wall. I found long ago that the ureter should not be held in place as it perforates the intestinal wall, with a stitch that penetrates the ureteral coat. Such penetration results in edema and shutting off of the urinary stream.

In my paper I have stated at some length my reasons for changing my mind regarding the transplantation of the ureters in human beings. I still think that there will be some infection wherever the severed ureter has been transplanted into the bowel, but I believe a technic can be perfected whereby the infection is limited and the organism will probably be able to take care of the infection for many years and possibly forever. My plea is that patients with incurable vesicovaginal fistulas lead such miserable lives that they will take any fair chance to have their condition improved, and I firmly believe that this technic gives them that chance.

DR. JOHN A. MCGLINN, Philadelphia, Pa., presented a paper entitled **Cancer of the Uterus Following Interposition Operation.** (For original article see page 626.)

DISCUSSION

DR. E. H. RICHARDSON, BALTIMORE, MD.—The occurrence of carcinoma after the Watkins' interposition operation is a rare thing. I have never seen a case and in the experience of the Johns Hopkins Clinic there has been no case of malignancy following the operation. The operation was first done in the Clinic in 1906 and to about April 1, 1927, there have been 209 cases operated upon by twenty-seven different operators. The visiting staff of the hospital which means the older, more experienced men, performed 90 of these operations, while the senior residents, men of at least four years apprenticeship, performed 119. There were seven deaths in the series, all of which occurred in the earlier years. One death followed pulmonary embolus; one was from postoperative hemorrhage on the tenth day; one from pyelonephritis with complicating bronchitis; another from postoperative hemorrhage associated with acute and severe parotitis on the eighteenth day; one from pyelonephritis and peritonitis on the tenth day; one from a pyelitis and septicemia on the twenty-fourth day; and one from surgical shock, which is the only death that has occurred in the Clinic during the past ten years from this operation.

There have been four recurrences, all of these in the earlier series when the technic of the operation was not familiar to the operators and where the operations were performed by the less experienced senior resident.

There have been quite a list of complications. There have been no instances of pregnancy. So far as possible this operation is done after the childbearing period, or if used earlier the patient is permanently sterilized and the uterus curetted at the same time. There has been no instance, so far as I could gather from the records, of a later hysterectomy being required for any cause. The complications were mostly of a minor sort, except those that I stated resulted fatally, such as the retention of urine requiring catheterization in twelve cases, postoperative hemorrhage occurring in nine cases, minor separations of the perineum occurring in nine cases, a varying degree of cystitis in seven and pyelitis in five. The other complications were one case of phlebitis, one of shock, one of bronchitis, and such minor things.

DR. WILLIAM S. STONE, NEW YORK CITY.—I have never seen cancer following this operation. I would like to discuss this case for the purpose of directing attention to what is really the modern problem, especially in cancer of the uterus, namely, the importance of recognizing precancerous lesions. Presumably, this operation was done on a uterus which contained something that was ultimately going to become cancerous, and which it was impossible to recognize at the time of operation. However, in the cervix, we often see such conditions which can be cured, and so prevent the development later of cancer. Early cancer of the cervix is often difficult, if not impossible, to recognize. One does not know, sometimes, where to take the biopsy specimen. However, that is no reason why we should not make every effort. I am quite sure that, in our clinics in New York, we do not see those neglected cases of lacerated and infected tissues of the cervix, which we were accustomed to see twenty-five or more years ago. Improved obstetrics is already demonstrated by their comparative infrequency at the present time. It would be interesting to know whether or not cancer of the uterus is really increasing in frequency as cancer in general is supposed to be. Personally, I believe that cancer of the uterus is relatively less frequent today, as compared with cancer of the stomach, or cancer of the breast, and that I think is a result of our improved obstetrics during the past twenty-five years.

DR. DOUGAL BISSELL, NEW YORK CITY.—The total number of interposition operations performed by me according to the Watkins' technic does not exceed twenty-five, yet out of this limited number two of them, subsequent to the initial operation, developed malignancy of the corpus and one proved to be malignant when the curettings removed at operation were studied.

In the first two cases, the disease did not develop until three or more years after the interposition operation; in both of these cases hysterectomy was performed and in each instance the operation was made difficult by the fact that the union between the bladder and the posterior surface of the uterus was so intimate that these organs were separated only with the greatest difficulty, in fact, the uterine wall in one of these cases was so friable that the removal of the corpus was impossible without breaking through into the uterine body, allowing the escape of its diseased contents; the ultimate history of these two cases is not known. The report on the curettings in the third case was unfortunately not received until the patient had left the hospital; she was then communicated with and advised that the uterus be removed, but she failed to return for operation.

My objections to the Watkins' interposition operation are that when it is performed in the childbearing period, it leaves a functioning organ in an abnormal position and that if pregnancy should occur, a complication then arises which endangers the life of the patient; that interposition of the corpus before or after menopause does not lessen the possibility of malignancy, that is, the cervix and corpus are just as liable to cancer when the corpus is interposed as when not interposed and that when malignancy of either portion of the uterus occurs following interposition, eradication of the disease, either by the application of radium or by surgery, is rendered more difficult.

DR. LILIAN K. P. FARRAR, NEW YORK CITY.—I wish to speak particularly of Dr. Watkins' name in association with the interposition operation. In Europe the discussion is whether the operation should be called Dührssen, Wertheim, or Schauta. I was in Vienna from 1901 to 1903 and frequently heard discussions as to who had first performed the interposition operation. Dr. Watkins' name was never mentioned as associated with the operation, and today his right to priority is not recognized in Europe. Dührssen performed the operation known as "vaginofixation," i.e., a suture is passed through the vesical peritoneum to the fundus of the uterus, and the fundus is then fastened forward below the bladder. In December, 1899, Dr. Watkins performed the interposition operation as it is done today. In January, 1900, Wertheim performed a similar operation but with this difference: the uterus was brought into the vagina and fastened there below the bladder, but the uterus was not covered with fascia or with vaginal mucosa. Some time later Schauta performed the operation with a technic similar to that of Dr. Watkins. Unfortunately Dr. Watkins did not publish his operation until September, 1900, and Wertheim did publish his operation in February, 1900, but the priority of performing the operation belongs to Dr. Watkins. As I understand that the Society has never expressed its belief in Dr. Watkins' right to priority in performing the interposition operation, I would like to ask if these statements cannot be verified, and the credit then given to Dr. Watkins in the Transactions of the American Gynecological Society.

DR. EMIL NOVAK, BALTIMORE, MD.—My experience with the Watkins' operation has been much more satisfactory than that of Dr. Bissell. Like most other operators, I do the complete interposition operation only in women beyond the menopause, although even then the modified procedure usually gives excellent results. In women of childbearing age, the modified operation is done. Even this, however, may occasionally give rise to complications in the event of later pregnancy, as I had occasion to observe in two cases. In one there was a miscarriage fol-

lowing a good deal of discomfort, while in the other a cesarean section was necessary at term.

Dr. McGlinn stressed the great rarity of cancer following the operation. As regards cervical cancer, at least, the obvious explanation for this would seem to be that in these operations we usually eradicate a good deal of precancerous pathology. Often the cervix is the seat of laceration, ectropion, and chronic endocervicitis, constituting a real cancer menace. Such a cervix should be removed as a preliminary to the Watkins' operation. I have been more and more impressed with the importance of correcting conditions of chronic cervical irritation, especially in women beyond thirty or thirty-five. After all, such measures constitute about the only form of prophylaxis against cervical cancer which we have available. Dr. Farrar called attention to this matter in a paper before this Society last year. Aside from this, the removal of the cervix, when it is at all elongated or hypertrophic, is an important contribution to the success of the operation. Unless it is removed, it pokes its way downward in the axis of the vagina, and often gives rise to almost as much annoyance as the original condition itself. One more point may be mentioned, though it is a rather obvious one. I have seen operators do the interposition first and then proceed to the cervical amputation, which is, under these conditions, awkward and difficult. It is obviously better to do the interposition after the removal of the cervix.

DR. JOHN O. POLAK, BROOKLYN, N. Y.—In cases of birth injury near the climacteric at the Long Island College hospital we not infrequently do a high amputation of the cervix followed by vaginal fixation. After this we introduce about 50 mg. of radium into the body of the uterus. This produces atrophy of the uterus and further safeguards the woman against cancer.

DR. HARRY S. CROSSEN, ST. LOUIS, MO.—I have had no cases of cancer of the cervix following the interposition operation.

DR. MCGLINN (closing).—I included in my paper a study of the various complications which occur after the interposition operation. While cancer may develop, as Dr. Novak and Dr. Polak have pointed out, if we do routinely a high amputation of the cervix as I always do, we take away the possibility of the incidence of cancer developing in the cervix, and if we do a hysterectomy instead we will eliminate the possibility of cancer developing in the body of the uterus.

As to the success of the operation, of course, we cannot use the Watkins' operation in every case, but in the properly selected cases I think it is by far the best operation.

I also claim a little priority in reference to the Mayo operation. In doing the hysterectomy according to his technic, two years prior to the Mayo operation, I pulled on the upper stitches and the bladder promptly slid over and I interposed the broad ligaments between the vagina and the uterus. I thought, however, that that was an accident and I did not publish it. I do the operation very frequently at the present time.

There are certain important points that a review of the literature brings out, particularly in reference to pregnancy.

Pregnancy is a serious complication if it develops after the operation. Three cases of pregnancy have occurred after resection of the tubes, so that interposition should be done if possible only after menopause, but if done prior to menopause the patient should be sterilized.

After reviewing the question of priority, my paper states that Dr. Pepper gives full credit to Dr. Watkins.

DR. FRED J. TAUSSIG, St. Louis, Mo., read a paper entitled **The Amniotic Fluid and Its Quantitative Variability**. (For original article see page 505, September issue.)

DISCUSSION

DR. HUGO EHRENFEST, St. Louis, Mo.—I believe that the average large weight of the placenta in these cases is due merely to the average large weight of the babies. Since in the main the secretion of the amniotic fluid is achieved by the placental surface, it would seem more important to investigate the size rather than the weight of the placenta.

The other interesting point is the obvious fact that there must be also persistently going on an absorption of amniotic fluid, and this process surely must play a rôle in the preservation of a normal amount of fluid or in the production of hydramnios. In his paper Dr. Taussig lays great stress on the swallowing of the fluid by the fetus. This explanation does not particularly appeal to me. What becomes of the amniotic fluid that the fetus swallows? We know that free urinary secretion occurs late in pregnancy. Certain clinical experiences prove that there must be some fetal kidney function earlier as well. I cannot conceive of the idea that the amniotic fluid swallowed by the fetus would be absorbed into the maternal circulation and not be secreted through the kidney back into the amniotic sac in the usual way. I therefore doubt the importance of lack of swallowing, proved in some isolated cases, as a significant etiologic factor in the production of polyhydramnios. I think the outstanding fact in connection with such instances of obstructed esophagus is the admitted frequency with which hydramnios is encountered in various types of fetal malformation. In the cases quoted by Dr. Taussig we recognize this prevalence of malformations in relation to polyhydramnios and I do not think that any of the various explanations of its origin so far advanced is really acceptable.

DR. J. WHITRIDGE WILLIAMS, BALTIMORE, MD.—Dr. Taussig did not tell us the cause of hydramnios, as I was hoping he would. In general, it may be said that we know almost as little about its cause as did our grandfathers. There are, however, one or two negative phases of the question. First of all, I do not think that hydramnios is due to syphilis, because in my experience, it occurs no more frequently in syphilitic than in non-syphilitic women, and particularly because it occurs in many women who are known not to have syphilis. In the second place, I do not think that any connection can be demonstrated with chorioangioma, and I base my conclusion upon the fact that hydramnios was absent in the cases in my service in which the placenta contained tumors of that type.

For years I have believed that in the great majority of cases the fetus itself has little to do with the production of hydramnios. This is clearly demonstrable in the so-called "dropsical ova," in which the amniotic cavity is distended by relatively large amounts of fluid, while the embryo is either very rudimentary or entirely absent. On the other hand, the evidence is very strong in hydramnios associated with single ovum twins that the excessive amount of fluid is due to renal activity on the part of the larger twin. In such cases, it is usually possible to demonstrate that the latter takes over an increasingly larger part of the intercommunicating placental circulation, with consequent hypertrophy and activity of its heart, liver, and kidneys, and that those organs are frequently several times heavier in the larger than in the smaller twin.

I think it fair to state that in most cases of ordinary hydramnios, the underlying cause lies in some derangement of the secretory activity of the amniotic epithelium, but at present no evidence is available as to how it is brought about.

DR. JOSEPH B. DELEE, CHICAGO, ILL.—Some years ago I gave to eight or ten women in labor methylene blue by mouth; then we watched the babies during birth and the diaper for three days after birth. The babies passed blue urine, the mothers did also, and the babies continued to pass blue urine for two or three days after delivery. That made me believe that the baby does not urinate into the amniotic sac.

I have been using magnesium sulphate in the treatment of eclampsia, and it has seemed to me that those women have less liquor amnii. We have only begun the treatment of these cases recently and I offer this suggestion for what it may be worth.

DR. GEORGE W. KOSMAK, NEW YORK CITY.—There is one point in the pathology of the amniotic membranes that I had hoped Dr. Taussig would bring out; namely, the disputed question as to whether this membrane is permeable by bacterial organisms. We get undoubted infections of the fetal skin resembling the small impetigo blebs that sometimes occur after birth, from which can be secured pure cultures of staphylococci. It is usually assumed that the contents of the amniotic sac are sterile and that they do not become infected until after rupture of the membranes. But how can we account for these cases of what seemed to be undoubted infections of the fetus where the rupture of the membranes has not occurred?

Another point that we should take up in this connection is pulmonary infection of the fetus. In autopsy studies of fetuses made at the Sloane Hospital some years ago, pulmonary involvement to the degree of an actual pneumonia was found and in those cases infections of the lungs undoubtedly occurred before the babies were born.

DR. JOSEPH L. BAER, CHICAGO, ILL.—I would like to refer to a case of an unusually rapid reformation of the lost liquor amnii. This patient had been married five years before becoming pregnant. After sixteen to eighteen weeks of pregnancy, about when she was expected to feel life, she suddenly flooded the bed. The uterus shrunk from the size of an eighteen weeks' pregnancy to a small hard mass, the size of a scant twelve weeks' pregnancy. I revisited her in two days and the uterus had entirely regained its original size; the quantity of fluid was apparently completely restored; within two weeks thereafter the patient felt life and the pregnancy continued uneventfully.

DR. TAUSSIG (closing).—Regarding Dr. Ehrenfest's criticism of the evidence of the swallowing of fluid by the fetus, I think the evidence is very strong that this plays an important rôle. Experimentally we know that if lycopodium powder is injected into the amniotic cavity it will be swallowed by the fetus as early as the middle of pregnancy, and that this occurs regularly in the last half of pregnancy there can be no doubt.

Furthermore, the blood supply of the fetal kidney is relatively slight compared with that of the intestines and I feel that fluid can pass much more rapidly through these intestinal vessels out via the cord than it can possibly pass the secretorial function of the kidney. In those cases of obstruction of the urinary tract that Dr. Ehrenfest refers to, examination of the fluid shows that it corresponds rather to the fluids found in edema and that this fluid is very frequently only a portion of a general anasarca.

Dr. DeLee's experiments are very interesting. The work that has been carried on along that line shows that the methylene blue does pass into the amniotic cavity, but it passes as a colorless chemical and so gives definite evidence of the metabolic function of the amniotic epithelium.

My report is rather in the nature of a preliminary communication which I hope to amplify in the future by more extensive biochemical study of the amniotic fluid and of the amnion.

DR. ARTHUR H. BILL, Cleveland, Ohio, by invitation, read a paper on **The Treatment of Placenta Previa**. (For original article see page 523, September issue.)

DISCUSSION

DR. EDMUND B. PIPER, PHILADELPHIA, PA.—Dr. Bill should have differentiated between the ward cases and his own cases, watched from the beginning of their pregnancies and in labor. It has been my experience that the maternal mortalities are largely among ward cases where there is no record of the blood lost. I recall a case similar to the one he spoke of which emphasizes a point. The patient was easily delivered by version, with a partial placenta previa and a wide open cervix. Cesarean section was unnecessary in that case. Shortly after operation the patient was dead. She had not had a postpartum hemorrhage that would disturb the pulse of an ordinary individual. Dr. Bill stated, I think, that the cause of death in every case of placenta previa is postpartum hemorrhage. He spoke of bags as a conservative treatment. If one uses bags in central placenta previa, or the old method of pulling down one leg and using that as a tampon, it seems to me that the fetal mortality will be at least greatly increased; whether you will get better maternal results I do not know.

Another point I gathered was that there is rarely postpartum hemorrhage following cesarean section. I think the indication for cesarean section in placenta previa depends not upon whether the patient is a multipara, but upon the condition of the cervix. If there is a dilated cervix you may succeed with a vaginal delivery, but I think true conservation is where there is no progress in labor and where cesarean section is electively done.

One thing Dr. Bill did not mention and I may be entirely wrong about it, but following the case I spoke of, I have made it a routine practice, just as in the vaginal delivery of a premature separation, to pack every case of placenta previa that is delivered through the vagina. Hemorrhage usually comes from the lower uterine segment.

DR. BENJAMIN P. WATSON, NEW YORK CITY.—The great difficulty in discussing the treatment of placenta previa and especially in attempting to lay down a definite routine is that cases differ so much in severity, and so much depends upon the time at which the case is seen and upon the way in which it may have been handled previously. There is not and never can be one standard form of treatment for all cases. One would like to know in any series of cases how many had been seen at first hand by the man who ultimately treated the case and how many had been handled in the hospital.

That discussion of alternative treatments is necessary is shown by the high maternal and fetal mortality obtaining in our obstetric hospitals. Along with Dr. Douglas Miller I made an analysis of the 279 cases in the Edinburgh Royal Maternity Hospital between the years 1914 and 1924. The maternal mortality was 8.9 per cent and the fetal 64 per cent. Munro-Kerr reported a series of 476 cases in the Glasgow Maternity Hospital with a maternal mortality of 11.5 per cent and a fetal mortality of 71.84 per cent. Miller, of New Orleans, in 40 cases reports maternal mortality 20 per cent, fetal 54 per cent. In the Boston Lying-in Hospital in a series of 151 cases occurring between 1915 and 1925 Kellogg found a maternal mortality of 8.25 per cent. In the five years from 1921 to 1926, 57 cases treated in the Sloane Hospital, New York, gave a maternal mortality of 7

per cent and a fetal mortality of 47.4 per cent. The best results I have seen are those of Essen-Møller who, in 132 cases, had a maternal mortality of 3.7 per cent and a fetal mortality of 45.6 per cent. No surgeon is satisfied with such results and consequently there is a growing tendency to discard the older methods of treatment and resort more and more to cesarean section. With this tendency I am in agreement provided it be recognized that cesarean section is not to be regarded as a routine treatment for all cases but that it be performed only on certain definite indications. What these indications are cannot be laid down arbitrarily. They can only be determined in the individual case by one who is a trained obstetrician with experience in all the other methods of treatment available.

If the child were the only consideration there could be no doubt that cesarean section would be the best form of treatment in practically every case. Even when the child is premature cesarean section offers a better chance of life than any other form of delivery, so that if pregnancy has advanced beyond the thirty-fourth week it must be considered from this point of view. We do cesarean section in minor degrees of contracted pelvis rather than risk the life of the child by a version or high forceps operation. We look upon destructive operations on the living child in order to effect delivery as only justified in rare and exceptional cases. Yet when we use a bag in a case of central placenta previa, and especially when we do an early version and bring down a leg, using the child as a plug, we are sacrificing it almost as deliberately as when we do a craniotomy. My Edinburgh figures show a fetal mortality of over 90 per cent in central placenta previa treated in this way, and of 75 per cent in cases other than central. From the point of view of the child the argument for cesarean section is unanswerable if the child has reached a viable age.

Again quoting the Edinburgh figures the maternal mortality in cases of central placenta previa was 23.5 per cent and in cases of partial placenta previa just over 4 per cent. In the Sloane Hospital the corresponding figures in a much smaller number of cases are 13 per cent and 5 per cent. This is a strong argument for cesarean section in cases of central placenta previa, for the recorded statistics, when cesarean section has been done in such cases, show a maternal mortality of from 5 to 7 per cent.

Essen-Møller (*Acta Gynecologica Scandinavica*, 1921, Vol. i) advocates vaginal cesarean section, having thus treated twelve patients without maternal or fetal death. I think the consensus of opinion in this country is against such a procedure. I certainly should not like to undertake it in the type of case where one thought that something more radical than a bag or version was required.

It cannot be too strongly emphasized to the profession that success in dealing with a case of placenta previa depends upon:

1. The immediate hospitalization of the patient on the first hemorrhage;
2. The examination of the patient only after the most careful preparation and when everything that may be necessary in the treatment of the case is ready to hand; and
3. Transfusion of cases where there has been severe loss of blood.

If we saw all patients under such circumstances, before any treatment, such as packing or bagging, had been already done, a larger number would be found in the cesarean section class, and as a result, there would be an improvement of both maternal and fetal mortality figures. A very large number of cases would require no treatment at all other than perhaps rupture of the membranes. In my Edinburgh series there were 29 such cases with no maternal deaths and a 31 per cent fetal mortality. When a vaginal pack alone was used in 20 cases there were again no maternal deaths and a 50 per cent fetal mortality. When version was necessary, after packing, the maternal mortality was 18 per cent. In many of these

cases the packing had been done outside the hospital. There can be no doubt that this combination is a very dangerous one and for that reason the vaginal tampon ought to be very seldom used. If the patient cannot be hospitalized and adequate assistance secured, the safest procedure in the hands of the ordinary practitioner in domestic practice is version and the bringing down of the leg. The fetal mortality will be high, but the maternal will be less.

I have been very much impressed with the fact that preliminary transfusion is a most important thing in the treatment of those cases. We have had comparatively little experience with it, for transfusion had not reached the stage with us in Edinburgh that it has reached here. I am very much impressed with the results shown and think we owe a debt of gratitude to Dr. Bill for bringing this subject to us in such convincing form.

DR. M. PIERCE RUCKER, RICHMOND, VA.—I have had no set program for the treatment of placenta previa. At first the mild cases were allowed to take care of themselves; the more severe ones were treated by Marmaduke Wright's version, and the most severe cases by cesarean section, but as I became more accustomed to Potter's version I have relied more and more on this operation and upon the Voorhees' bag to control the hemorrhage. If the bag be used it should be a large one, preferably a number five.

In my eighty cases there was one maternal death, a case that illustrates well Dr. Bill's plea for a preliminary blood transfusion. This patient was brought forty miles to the hospital after her third severe hemorrhage in as many weeks. Like Dr. Bill's case, her husband was not enthusiastic about blood transfusion. While we were hunting around for a suitable donor, I introduced a No. 5 Voorhees' bag extraovularly. The cervix dilated with unexpected rapidity and I was forced to operate without the patient's being fortified by the transfusion. I did a version under ether anesthesia with practically no loss of blood. The patient died one and a half hours later of dilation of the heart.

My maternal results so far as febrile puerperiums are concerned are shown in Table I. Table II shows the fetal deaths in the whole series and also in those cases that had reached near term.

TABLE I. SHOWING MATERNAL RESULTS IN TREATING EIGHTY CASES OF PLACENTA PREVIA

MODE OF DELIVERY	NO. OF CASES	INFECTIONS	
		NO.	PER CENT
Spontaneous delivery	15	2	13
Bag	5	0	
Pituitrin	1	0	
	21		10
Breech extraction	3	1	33
Bag	5	1	20
	8		25
Low forceps	1	0	
Craniotomy	1	1	100
Cesarean section	5	0	
Braxton Hicks' version	6	0	
Bag	3	0	
	9		
Potter's version	6	2	33
Accouchement forcé	3	0	
Bag	25	0	
Pituitrin and bag	1	0	
	35		6
Total	80	7	8.75
Total number of bag cases	41	1	2.44
Accouchement forcé	3	0	

TABLE II. SHOWING FETAL DEATHS IN TREATING EIGHTY CASES OF PLACENTA PREVIA

MODE OF DELIVERY	TOTAL FETAL DEATHS	DEATHS OF FETUSES ABOVE 45 CM. LENGTH
Spontaneous delivery	4 (27%)	1 (8%)
Bag	5 (100%)	2 (100%)
	9 (43%)	3 (21%)
Breech extraction	3 (100%)	0
Bag	4 (80%)	2 (66%)
	7 (88%)	2 (66%)
0		
Craniotomy	1 (100%)	0
Cesarean section	2 (40%)	0
Braxton Hick's version	1 (17%)	0
Bag	3 (100%)	0
	4 (33%)	
Potter's version	1 (17%)	0
Accouchement forcé	1 (33%)	0
Bag	9 (36%)	4 (20%)
Pituitrin and bag	1 (100%)	0
	12 (34%)	4 (14%)
Total	35 (44%)	9 (17%)
Total bag cases	22 (54%)	8 (29%)

DR. RUDOLPH W. HOLMES, CHICAGO, ILL.—Read and Mueller, many years ago, compiled an exceptionally large number of cases of placenta previa: the causes of death from both statistical studies were essentially the same: one-quarter died from antepartum hemorrhage, about one-half from postpartum hemorrhage, and a quarter from sepsis. These cases were accumulated early in the antiseptic days, therefore, sepsis was prevalent: in these later days the mortality rate, from better asepsis, and technic of delivery, has fallen enormously, yet the relative incidence from septic deaths has not varied from those early statistical studies.

In 1905 I collected all the available cases of cesarean section for placenta previa. The mortality was so high that I stated in my paper that cesarean section killed a woman in order that a baby might be saved: this statement was substantiated by a comparison of mortalities in women treated obstetrically. Of course this statement is no longer true: but at the time of writing that paper I was convinced that cesarean section was a mistake when applied to the placenta previa case. Today, I believe cesarean section is the only approved method of delivery under certain conditions obtaining in placenta previa. I still believe the old obstetric aphorism that we must consider the mother and largely disregard the welfare of the baby in placenta previa is as true now as when first stated: the hemorrhage from placenta previa is rarely evidenced at term, its usual appearance is from the sixth to eighth month, therefore, the premature babies are compromised before delivery takes place. Kuehn found that of some twenty-five babies born alive from placenta previa mothers only one was alive at the end of two years.

After all is said and done the incidence of placenta previa is very low: I have had only two cases in all my personal private practice. As we find them, placenta previas reach us through the clinic and consultation—as a result the women come to use untreated, mistreated, in exsanguination. The untreated patients are more amenable to our care than the mistreated ones, for they have not been contaminated by unclean hands.

Cesarean section has its definitely clear field: first, in all women who not only have the previa but have a contracted pelvis; secondly, in a complete previa in a primipara or multipara. A primipara with placenta previa even of a partial degree, is more wisely delivered from above; in a lateral previa I would hold that pure obstetric procedures are more appropriate. That obstetric procedures have their

due place in previa is evidenced by the fact that Stratz had 167 cases with one death, his fifty-fifth case.

The personal equation must always be one of the essential factors in determining whether this or that procedure shall be employed in a given case, and this is nowhere more important than in the treatment of placenta previa. Many consider the tampon as an obsolete procedure, but I am firmly convinced that it has its place, as a prophylactic measure when the woman must be transported a long distance over bad roads to the hospital, or in an hospital when an alarming hemorrhage occurs and one must wait until the operating room is "set up"; when blood transfusion is imperatively necessary, the tampon will give time for the woman to react.

DR. JOSEPH B. DE LEE, CHICAGO, ILL.—I would like to call attention to the fact that the loss of blood may not always be determined by the pulse rate, by blood pressure readings, or by the blood count. For temporary periods nature has a means of keeping these physical conditions at a stage that impresses one as being normal or near normal when, as a matter of fact, there is depletion which will show up after delivery.

My treatment of placenta previa is now reversed. It used to be unusual to do cesarean section in placenta previa; now it is exceedingly unusual not to do it. When a patient enters the hospital with a suspected placenta previa, if not at term, she is put to bed to rest, and morphine is given to stop the pains. If there is sufficient hemorrhage to justify interference the patient is prepared for every possible method of treatment, and we decide what method we shall use after the first examination. If her condition is not too bad she is sent to the x-ray room and a picture taken to see if there is monster. Dr. Greenhill has collected from the literature 46 cases of monstrosities in placenta previa. Of 16 monsters that we have had in the Chicago Lying-in Hospital, eight were associated with placenta previa.

Primipara whether they are young or old are always delivered by cesarean section. A central placenta previa always has cesarean section done. If the patient is a multipara and has many living children we may do a Porro operation. The most important decision, however, is not whether she is to have an abdominal delivery, but what form of abdominal delivery? The low cervical cesarean is so much safer than the classical cesarean that the indication for the operation is doubly strong when one is capable of doing it. In the classical operation the placenta has to be cut through in one-half of the cases and there is more or less severe hemorrhage until we get the baby out; with the low cervical, the placenta is normally above and we do not have to fear hemorrhage. However, in doing the low operation for placenta previa one has to go through the placenta if it is on the anterior wall. If it is on the posterior wall this is not necessary. The risks of hemorrhage are about the same for both methods. If the placenta is on the anterior wall the patient should be fortified with a transfusion, or salt solution, because sometimes the amount of hemorrhage is as great as in the classical cesarean and might be very dangerous.

Referring to Dr. Bill's patient who died, I think there are possibly two explanations: First, that the woman may have had a bleeding from a torn vessel in the placental site. Sometimes these can be sewed up with the low operation, but not in the classical. Secondly, the sutured uterus may have ruptured during an after-pain because no matter how well the uterus is sutured, it may burst in the classical cesarean section. There are 14 cases on record.

DR. ALFRED C. BECK, BROOKLYN, N. Y.—Cases of placenta previa usually are potentially infected when they enter the hospital and for that reason cesarean section, in our opinion, is contraindicated. In the few instances, however, where we have done cesarean section the results have been very good. Most of our patients have been treated by the older methods, and our results have been much better than

those reported this afternoon. We believe this is due to what Dr. Holmes has already stressed, namely, disregard of the child when once the decision is made to handle the case from below.

When a version is done we let the woman deliver the child. When the bag is inserted, if the head follows the bag we wait for spontaneous delivery. In that way we avoid trauma to the cervix and placental site. Likewise we avoid the need for anesthesia, and by eliminating these two factors we probably avoid many cases of postpartum hemorrhage.

DR. BILL (closing).—The fetal mortality mentioned in my paper was given merely for the sake of statistics and not as a reason for performing cesarean section, because we all know that cesarean section gives the lowest fetal mortality. The argument in favor of cesarean section was that it gave the best results for the mother. The fetal mortality of 35 per cent is probably as low as one could expect. That included all the premature babies and stillbirths.

We do not pack the uterus after cesarean section for placenta previa and ordinarily do not encounter postpartum hemorrhage. The uterus was not packed in any of the cesarean operations reported.

Dr. DeLee questioned whether the one death could have been due to bleeding from the placental site. I do not believe so because after delivery, when the uterus contracted and remained firm, there was no bleeding.

I do not believe the patient's condition can always be estimated by the pulse rate. The pulse is sometimes not rapid even though the patient is pretty well exsanguinated. While the blood pressure may not indicate exactly the loss of blood it does indicate the degree of shock resulting from the hemorrhage and I believe it is probably the most dependable test we have for estimating the condition of the patient.

In choosing cesarean section for placenta previa we do not consider the age of the patient, nor the parity, nor do we consider very much the grade of placenta previa present and do not make any special effort to determine that by examination. If the patient has a complete previa she will bleed before there is dilatation. If there is no bleeding until there is considerable dilatation and this is controlled by the head, there is naturally a placenta previa of lower grade and those are the cases which do not require a cesarean section. Therefore, I believe that the cervix is the determining factor in deciding whether or not to do a cesarean section.

I agree with the statement that our more serious cases are among the ward cases. A private patient who has an antepartum hemorrhage usually reports it at once whereas sometimes the ward cases are neglected and sent to the hospital as emergency cases after having bled for some time. I believe that the length of time over which bleeding has taken place is a very important factor. I spoke of two cases. One seemed about as serious as the other, but one lived and the other died. These cases illustrate the fact that the patient who has a severe hemorrhage and is treated immediately will probably recover because she is not in the same condition of shock as the patient who is allowed to bleed over a considerable interval of time and who has reached a condition of shock from which she may not recover.

Regardless of the choice of method for delivery in cases of placenta previa, prophylactic blood transfusion is a most essential part of the treatment.

(To be continued in December issue.)

NEW YORK OBSTETRICAL SOCIETY

MEETING OF FEBRUARY 8, 1927

DR. CHARLES A. GORDON read a paper entitled **Respiratory Emphysema in Labor**. (For original article see page 633.)

DISCUSSION

DR. GEO. W. KOSMAK, after referring to his own case reported some years ago, agreed that this constitutes one of the more unusual complications of pregnancy and believed the most likely explanation is that the trachea or some of the larger bronchi rupture through the voluntary expulsive efforts made by the patient. Usually these women are directed to take a long breath and hold it, which fills the respiratory passages with the maximum amount of air, and they are then urged to bear down. Just why these respiratory passages rupture in one woman and not in another is pretty hard to explain. Dr. Kosmak felt that the lesson to be learned from this presentation is that we had better desist in instructing our patients to hold their breath when bearing down. In the cases reported only two deaths occurred. The others got well. At the same time, it is a rather disagreeable experience. It frightens the patient a great deal and likewise worries the attendant.

DR. HERMANN GRAD said that he had seen one case of emphysema following labor. The patient was a primipara and while he was doing a low forceps operation the house surgeon, who was giving the chloroform, remarked that there was something very peculiar on the left side of the patient's neck. After delivery palpation gave the characteristic crackling sensation but nothing abnormal was found in the chest. The next day the patient complained of some difficulty in swallowing, and examination of the buccal cavity showed an area of trauma, the mucous membrane was bluish on the left side. The emphysema did not spread after labor and disappeared in about ten days.

DR. GORDON (closing) said that Dr. Kosmak's theory that it is due to a wound of the trachea, is also held by many others, and yet it is one which is difficult to prove on account of the cartilaginous strength of the rings of the trachea. He found three or four cases reported under the head of hernia bronchialis. Three were cases in which the woman following labor had not recovered, but showed a large tumor in the neck, which looked like an enlarged thyroid, and the condition was then referred to as "aerogenous goiter." That was in 1853. In the subsequent labors the swelling of the neck got larger and larger. During inspiration if the patient took a long breath, the air would disappear from the tumor of the neck, and when she expired it would fill again. Hernia bronchialis then was thought to be caused by a rupture of the cricothyroid membrane, a little tear which allowed the mucosa of the trachea to come through the wound. Others held that the wound in the trachea was caused by violently throwing the neck back. That also cannot be substantiated, and in all this work no pathologic evidence of any kind has been brought forward.

DR. F. C. FREED (by invitation) presented a paper entitled **Clinical Signs of Fetal Distress During Labor**. (For original article see page 659.)

DISCUSSION

DR. ASA B. DAVIS felt that the paper did not stress sufficiently the irregularity of the fetal heart. The slowing of the fetal heart is, of course, a danger signal, but occasionally it slows and then becomes very rapid, as in one case, a primipara

in the first stage of labor. Her first stage was slow and went on for twelve hours. Then the fetal heart after coming down to about 100, went up to 180 and 190, and between the pains it would assume the normal rate, and then stop. Dr. Davis did a manual dilatation and brought the cervix down, slit it on both sides and did a version. The hand in the uterus failed to detect any pulsations of the cord, and the child was going through paroxysms as though it were about to die. There was a true knot in the cord that had been drawn absolutely tight, so that the circulation had been cut off intermittently.

DR. PAUL T. HARPER asked about the comparative value of ether as contrasted with chloroform for the relief of persistent uterine tonicidity in an attempt to conserve the fetal heart, and as to the frequency with which Dr. Freed noted an acceleration of the fetal heart before a drop.

DR. WILLIAM PFEIFFER said that in making a study of some cases of true cord knots no change in the heart and no sign of asphyxia of the baby could be noted. Not only is the rate of the baby's heart after the contraction has passed off, important, but also how quickly it returns to normal. Polak pointed out some time ago, during the furor of "Twilight Sleep," that a heart that might be slowed down would return quickly to the normal; hence the child would not be in danger. If the heart came back slowly and haltingly to the normal rate, there was danger. Dr. Pfeiffer did not agree that the meconium can be disregarded in head-first cases, but always felt that the child was at least partially asphyxiated. If we recall the mechanism by which the meconium is found in amniotic fluid, it is in itself an evidence of asphyxia, otherwise the anus would not relax.

DR. GEO. W. KOSMAK said it seems rather strange that during the comparatively long period in which the fetal heart rate has been observed, we still rely on the ordinary stethoscope. The physicists have succeeded in developing instruments that demonstrate the fetal heart sounds much more satisfactorily than we are able to get them with the stethoscope, and yet few of the obstetricians have ever favored this method. Peterson, of Ann Arbor, made use of an apparatus of this kind whereby the fetal heart could be recognized by the attending physician through the telephone while reposing calmly in his bed at home. None of the maternity hospitals have taken up this question and attempted to use an apparatus of this character, although the physicists are evidently aware of its importance.

DR. HERBERT THOMS made a plea for direct auscultation in those cases where the fetal heart is not readily heard with the stethoscope. By placing a towel over the patient's bare abdomen and by listening with the ear firmly placed on this covering, the fetal heart may be heard with surprising clearness, especially in certain cases that are difficult to elicit with the stethoscope.

DR. FREED (closing) recalled that Dr. Falls and Dr. Rockwood, of the University of Iowa, described a microphonic stethoscope devised to magnify the heart tones so that they could be heard throughout the room. G. Schwartz, of Königsberg, devised an apparatus similar to the electric cardiographic machine that would give a graphic representation of the fetal heart sounds. Nauche, many years ago, invented the metroscope, a curved instrument that could be introduced into the vagina. It was fashioned after the stethoscope, and with it he claimed to have heard the fetal heart sounds earlier in pregnancy than they could be heard by other means. For many of his observations Dr. Freed used a Falls' modification of the DeLee stethoscope with a watch and mirror attachment, but such a stethoscope is cumbersome, fragile and expensive, and cannot be recommended for general use. In none of Dr. Freed's cases was pituitary extract used. Pituitary extract should be used only in minimum doses if the welfare of the baby is to be guarded.

Dr. Freed used only chloroform in the cases mentioned, as it does not irritate or excite the patient, and its effect is almost instantaneous, giving immediate relaxation of the uterus, thereby relieving undue pressure on the placenta and fetus. Rarely did he observe a primary acceleration of the fetal heartbeat before the fetal heart slowed down. When a slowing occurred, in the majority of cases, it was sudden and without such a warning.

Meconium, in vertex presentations, appeared so frequently without changes in the fetal heart rate that he did not regard this of serious importance. It has been noticed especially frequently since using the morphine and magnesium sulphate and rectal ether-quinine instillations for analgesia. However, we have no proof that the drugs have been responsible for it. Excessive pressure of the uterus on a large baby may cause it by actually forcing meconium through the sphincter ani. Only when the appearance of meconium was noted with an accompanying slow fetal heart rate was its presence considered significant.

CHICAGO GYNECOLOGICAL SOCIETY

STATED MEETING, JANUARY 21, 1927

DR. CAREY CULBERTSON presented two specimens from cases of **Excessive Bleeding from the Uterus.**

The first patient, Mrs. L. E., forty-three years of age, had been bleeding for the past four or five months and at the same time she had a swelling in the lower abdomen. This swelling was perfectly symmetric, round, rather firm, and about the size of a five months' pregnancy. The cervix was soft and patulous. Menstruation was normal.

The last periods occurred on November 4 and December 2. She had two children living and well. She was under observation in the Cook County Hospital for twenty-eight days before operation. The possibility of pregnancy, hydatid mole, adenomyoma, cystic fibroid were all considered.

At operation a cyst of the anterior uterine wall was found. The uterine cavity was four and one-half inches deep, the mucosa was normal, and the cavity empty. The cystic swelling contained about sixteen ounces of clear serous-like fluid which coagulated upon exposure to the air. The cavity was lined by a thick yellow membrane with a shiny surface, probably representing a fatty degeneration of the capsule, with a complete cystic change of a fibroid.

The second specimen also represents excessive bleeding in a patient, forty-two years of age, who had never been pregnant. This patient had never had regular periods; sometimes they occurred every three weeks and again every two weeks, with never more than four weeks between them. If excited, worried, or annoyed she would menstruate at once. The duration of the period was usually seven days; very profuse, with clots. There were cramps at times on the first day. Her last period was January 2. On examination the vagina was nulliparous, the cervix was closed and free, the corpus upright and free but enlarged and slightly asymmetric, giving the gross appearance of containing a small fibroid. The appendages were free and not involved.

She was operated upon on January 17. The uterine wall was twice the normal thickness and fibrous, the cavity two and one-half inches deep, the mucosa markedly hyperplastic and polypoid. The cervix was elongated. One pea-sized submucous fibroid growth was in the anterior wall. A vaginal hysterectomy was performed.

Here we have an unusual case of fibrosis uteri in a nullipara. The condition is rare but has been described by Fletcher Shaw, who thinks this increase in the size of the uterus is a work hypertrophy and is always associated with hyperplasia of the endometrium.

DR. SIDNEY SCHOCHET reported two cases of so-called **Primary Adenocarcinoma of the Appendix.**

These cases are very often overlooked and not diagnosed until the appendix is microscopically examined, and have been erroneously termed primary adenocarcinoma. They belong to a group of tumors which are really endocrine and arise from glands in the appendix, take on a peculiar silver nitrate stain, and are better classified as argentine tumors. They are small, malignant, and have a tendency to metastasize. The cells are small with clear vesicular nuclei well defined and are diagnosed from the silver stain. The cells have no connective-tissue stroma.

In the first case the tumor was diagnosed only on microscopic examination of the appendix.

The second patient was a woman, thirty years of age, who came in with a dull aching pain in the region of the right quadrant, with symptoms of chronic appendicitis. The appendix was removed. Microscopic section demonstrated definite endometrial tissue; in other words, an adenomyoma of the appendix.

The third case was an adenoma of the umbilicus. There was no history of a previous operation or a transplantation from the endometrium.

DR. GILBERT FITZ-PATRICK, by invitation, presented a paper entitled, **How Shall We Deal with the Cancer Menace?** (See page 616.)

DISCUSSION

DR. C. S. BACON wondered how much danger there is in cancerphobia, from such meetings, in women who have wrought themselves up to a state of nervous excitement which has a bad effect on their physical being and has led to a great deal of unhappiness.

DR. HENRY SCHMITZ said that if we could demonstrate to the physicians carcinomatous uteri in various stages we then could point out the early and hence operable cases. This would help in two ways: In the first place to bring the patients earlier for diagnosis, and secondly, to exclude from unnecessary operation many of these patients. The suggestion of the American Society for the Control of Cancer that in every medical school there should be arranged a yearly cancer day for senior and junior students in which the various specialists would discuss the clinical and diagnostic aspects of carcinomas in various regions of the body, would induce the student to give cancer disease the attention that it deserves. Dr. Schmitz did not believe that by instruction of the laity carcinomaphobia would be caused. If a person could be made to worry over the ulcer, the sore, or the hemorrhage that might be cancer, we would then have attained the purpose for which the work was undertaken, namely, to have the chronic sore and the chronic lesion examined by competent men to exclude carcinoma. This certainly would induce many patients to have such lesions looked after immediately instead of waiting until they begin to grow and cause harm.

Concerning the second question, of cancer control: It seemed to him that cancer hospitals and cancer clinics would serve their purpose. The medical practitioner and student may go to these institutions and be instructed in the clinical aspects of cancer diseases. Such enlightenment would certainly tend to send patients to the hospitals earlier for treatment. Surgery and radiation therapy have reached

such a stage of perfection that we cannot blame the bad statistics of cancer on the treatment. If cancer cases would come to the specialist when the disease is still in the localized stage, then operation would certainly cure 75 per cent of the cases. By "cure" is meant that the patient five years after treatment is free from any palpatory and visible evidence of the disease.

DR. FITZ-PATRICK (closing) said in reference to cancerphobia that a large number of diseases have a psychosis entity. In cancer it is "fear"; as a rule this will lead the subject to seek advice. A consultation is undertaken by a patient as a serious piece of business. The physician should so consider the interview, and after a painstaking examination, advise the patient, or refer him for an adequate opinion.

It was his observation in this respect that some members of the profession are very derelict; patients are sent away after a casual or no examination at all, advised to await developments. They are dissatisfied, the spell of "fear" has not been dispelled, they seek other advice, read questionable literature, and may fall into the hands of charlatans. For these and other reasons, known facts in the advancement of medicine must be made available to all the profession and for the special benefit of mankind.

If the members of the medical profession do not respect this dictum and assume their responsibility in the dissemination of knowledge and through adequate advice founded upon a complete and satisfactory examination, they must expect the quack, the faker, and charlatan to flourish, because this is an inquiring age, and the people are seeking knowledge and service. They have assumed their financial responsibility through buying stamps for the control of tuberculosis and the incidence has been cut in two. They are ready likewise to meet the cancer problem, and it is the duty of the medical profession as a whole to prepare themselves for the task.

As to a Cancer Research Hospital maintained by the state, although the statutes provide for the care of the destitute in each county, a special hospital manned by an able staff of experts, assisted by a corps of earnest workers is highly desirable. A large number of patients could be studied, careful tabulations recorded, new treatment employed. For until the problem of cancer is solved it is the people's business to assist and provide a place wherein special research can be conducted to the end that it is their welfare that confronts the state.

DR. HENRY SCHMITZ read a paper on **Carcinoma of the Uterine Cervix**.
(For original article see page 580.)

DISCUSSION

DR. SIDNEY SCHOCHET said it was difficult to discuss any subject of which we do not know the etiology or what led to the conclusion. In this paper one conclusion would be that function is a great factor and a second conclusion would be that inflammatory conditions were an etiologic factor.

Dr. Schochet claimed that Dr. Schmitz is deserving of special credit for giving to the medical profession a clinical classification as to the extent of malignancy. That classification is being used extensively, especially by Ward, because it does give us some common ground as to what we mean by the extent of malignancy, and has brought us a great step forward in concluding what particular methods of treatment should be used.

His point as to the degree of malignancy and as to the type of cells, is entirely new, and yet judging from the remarks that have been made Dr. Schochet would question very seriously whether one could state the extent of growth by the type of mitosis, because we know all tissues have a periodic wave of growth. If you

should happen to catch the normal tissue at a certain level the number of mitotic figures will be less than in the actively growing normal tissue.

DR. N. S. HEANEY said that Dr. Schmitz mentioned infection and irritation as etiologic factors in the causation of cancer of the cervix. At the last meeting of the American Gynecological Society, a paper was presented advocating the repair of all torn or diseased cervixes in order to prevent subsequent carcinoma of the cervix. Cancer in other parts of the body may be produced by irritation and infection. By analogy it might be argued that they may also produce cancer of the cervix. Who, however, knows of a single authentic case? Has anyone here seen a patient who has had a carcinoma of the cervix develop during the time that she was under observation for an infection of the cervix or for any other pelvic disease? Dr. Heaney saw one case where a carcinoma of the vault of the vagina developed around the posterior bar of a pessary which had not been changed for twenty-five years. That, however, was not a carcinoma of the cervix.

DR. CAREY CULBERTSON said that possibly our use of the term "pre-cancerous" is abhorrent to the pathologist, and we can spare the pathologist's feelings, by referring rather to atypical cellular proliferation. In these so-called minor lesions of the cervix, the important thing is the histologic diagnosis. One has to know whether there is an erosion or not before he treats it. The only way he can tell is by histologic examination of the tissues. If there is atypical cellular proliferation, the question is whether or not such a lesion is still an erosion. Microscopic examination also settles the question as to whether there is danger from an erosion, and how that danger may best be avoided. This question is not always easy to answer, but he agreed with Dr. Schmitz that there is always a predisposing lesion; cancer does not develop in normal, healthy tissue.

DR. IRVING STEIN asked whether Dr. Schmitz had ever seen a case of carcinoma of the cervix develop in a case of erosion which was treated by linear cauterization.

The present method of treatment by cauterization is extremely popular. This certainly does not cause complete destruction of that tissue. If what Dr. Culbertson says is true, we should see carcinoma develop as a result of cautery treatment.

DR. SCHMITZ (closing) said that the value of the histologic malignancy index lies in two facts: 1. The histologic factors considered are nine; namely, the type of cells, the variation in the size and the irregularities in shape of cells and nuclei, the functional activity of the cells, the distinction of the cell outline, the degree of hyperchromatism and the number of mitoses. 2. The numerical evaluation of these factors. For instance the number of mitotic figures are counted in ten fields with the oil immersion lens. If more than twenty mitotic figures were counted then the value 4 was given; if from fifteen to nineteen mitoses were counted, the value 3; from ten to fourteen the value 2, and for fewer than ten the value 1 was given. Again the irregularity of cells was determined as follows: If 50 per cent of the cells showed irregularity the value 4 was given; if 40 to 50 per cent, the value 3; 25 to 40 per cent, the value 2, and less than 25 per cent the value 1.

The numerous factors and the relative numerical evaluation obviously would permit an evaluation free of subjectivism and relatively free of error. Thereby mistakes are rendered practically unimportant. Those interested may review the original communication in the *American Journal of Roentgenology*, 1926, xvi, 30.

The present state of the high perfection of the technic of abdominal panhysterectomy and the application of radium and x-rays in the treatment of carcinoma of the uterine cervix, both executed by thoroughly trained clinicians, will probably not be improved. The bad results obtained in the treatment of cervical carcinoma

are not the results of poor surgical or radiologic technic, but should be assigned to the obvious fact that the patients enter the clinics in an advanced stage of the disease. The five-year cures in the clearly localized carcinomas belonging to clinical Group 1 and having a histologic malignancy index of 20 or less, show a percentage of 65 to 80 per cent of good five-year end-results. Hence, if the patients with uterine carcinoma would enter the clinic when an abnormal discharge is the only symptom, then the cures of carcinoma would rapidly improve. As soon as a cancer bleeds, a breakdown of tissue or an erosion of blood vessels has taken place. Such a cancer shows usually a remarkable extension and must be inserted in the Groups 2 and 3 which means that the chances of a cure are very slight.

Hence any efforts made to induce the patient with a leucorrhea to submit to a careful examination and diagnosis would tend to an improvement of the good end-results. And in this connection Dr. Schmitz called attention to the relation of the chronic cervicitis and the cervical erosion to the so-called erosion cancer. Timely treatment of these diseases, and the repair of traumas caused by labor, certainly mean prophylaxis. Of course there exist also other factors, but those mentioned are probably the most important.

Toneff, M. E.: Conservative Treatment of Genito-Abdominal Tuberculosis in the Female. *Gynécologie et Obstétrique*, 1926, xiii, 205.

Four cases diagnosed "genito-abdominal tuberculosis" were treated with intramuscular injections of a solution of colloidal iodine. Improvement was rapid, beginning from the first to the third treatment. There was no notable reaction. Relief from symptoms was almost immediate, and cure is reported in three cases, followed for periods varying from two to ten years. The author thinks that this should be the treatment of choice in this condition, as laparotomy has many contraindications

GOODRICH C. SCHAUFFLER.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Selected Abstracts

Radiology

Favreau, Labeau and Bosc: Necessity for the Popularization of Radiography of the Fetus during Gestation. *Presse Médicale*, Oct. 1, 1924, p. 786.

The consensus of opinion of all workers in this field is that in the first half of pregnancy a positive demonstration of fetal bony parts is an exceptional occurrence.

In eleven cases studied before four and one-half months, the authors record six negative and five positive findings, two of the latter before the fourth month. After four and one-half months, all plates were positive. The authors feel that after the fifth month of a suspected pregnancy, one can consider a negative plate as a proof of the absence of a fetus. They hold that radiography is valuable as an aid in the differential diagnosis between tumor (e.g., fibroma) and pregnancy, in the diagnosis of fibroma plus pregnancy, in the differential diagnosis between acute hydramnios and ovarian cyst with twisted pedicle, as well as in the diagnosis of multiple pregnancy, of position and presentation, of fetal malformations (especially hydrocephalus), and even of lithopedion formation in an old ectopic pregnancy (DeLee).

The bony parts are demonstrable chronologically as follows: The vertebral column is shown earliest; then (in order), the base of the skull, the extremities, the cranial vault, the ribs, and finally the pelvis.

The procedure is absolutely harmless to mother and child, and has many clinical applications.

E. L. KING.

Jardin, R.: Diagnosis of Superfetation Based on Radiography. *Bulletin de la Société d'Obstétrique et de Gynécologie de Paris*, 1925, xiv, 444.

A thirty-four year old quadripara was delivered of twins, the first of which weighed 3000 grams and the second 1470 grams. The duration of pregnancy from the menstrual history was estimated at eight and one-half months. The pregnancy was of the double ovum type and while the placentas were attached to each other, there were two distinct circulations as proved by injection. The difference in size of the fetuses aroused the suspicion of superfetation. Roentgen-ray pictures were taken to search for epiphyseal centers at the lower ends of the femurs because it is believed that these centers indicate that a fetus is at or near term. These ossification centers were found in the first fetus but not in the second. The difference in weight in the two fetuses indicated to the author that there was a difference in age of about six to eight weeks and this he believes is proved by the fact that epiphyseal centers did not appear in the second fetus until it was six weeks old. The placenta of the second fetus occupied about one-third of the entire placental surface. There was no microscopic examination of the placenta but macroscopically no areas of degeneration were seen which might explain a retardation of development in the second fetus. The author believes this is a case of superfetation.

In the discussion of this paper, Cathala reported a case of twins which had very dissimilar ossification centers, yet he ruled out superfetation because histologic examination of the placentas showed them to be of the same age. Furthermore, in some cases of uniovular twins where there is no doubt that both fetuses are of the same age, there may be found ossification centers which are not equally developed.

J. P. GREENHILL.

Jardin, R.: Anatomic and Radiologic Studies of Ossification Centers in the Knee of the Newborn. *Gynécologie et Obstétrique*, 1926, xiv, 240.

The point of ossification in the inferior epiphysis of the knee joint appears about the ninth month of fetal life. It is always present in a child born at about term. At term it measures 4 to 6 mm. in diameter. The point of ossification of the superior epiphysis of the tibia appears at eight and one-half months, is not always present in the newborn at term and varies from 1 to 3 mm. in diameter. There is a constant relation between the length of the body and the occurrence of the points of ossification and a similar relation, but less marked, between the weight of the child and the degree of ossification.

Every newborn who does not present a point of ossification in the region of the knee, weighing less than 2,000 grams and shorter than 44 cm., has not yet reached the beginning of the ninth month.

GOODRICH C. SCHAUFFLER.

Susaki, R.: Roentgenologic Study of Uterine Involution Post Partum. *Kinki Fujinkwa Gakkwai Zassi*, 1926, ix, 28.

A semisolid mass was made with barium sulphate which was injected into the uterus of 80 healthy puerperae between second and thirty-fifth day postpartum. Roentgen films were made in dorsal and lateral positions in intervals. The following observations were made in these studies: Even thirty days after labor the uterine cavity had not narrowed to its normal lumen but still showed moderate dilation. As compared with the multipara, the cervical canal of the primipara contracted much slower, and even late in the puerperium it was still seen dilated. When cervix and uterine cavity were studied together in the films taken in these two directions, in many cases a rotation could be noticed, to right or left, of uterine body against cervix, outside of changes in anteversion or retroversion. In later periods of the puerperium retroversions were seen more often leading to the conclusion that secondary retroversion develops in the course of the puerperium.

AUTHOR'S ABSTRACT.

Biermer, L.: X-Ray Treatment for Ptyalism of Pregnancy. *Medizinische Klinik*, 1924, xx, 243.

It is well known that after x-ray treatment, especially in the region of the head, many patients complain of marked dryness of the mouth which persists for some time. This observation led Biermer to use the x-ray in an attempt to check temporarily the function of the salivary glands in a patient with ptyalism of pregnancy.

Before treatment with the x-ray the average fluid intake by the patient was between 1190 and 1300 c.c. The daily urinary output was between 350 and 850 c.c., while the amount of saliva varied from 550 to 800 c.c. daily. The latter figures, though large, do not represent the actual salivary output, for most of the saliva was swallowed. Psychotherapy and atropin were of no avail so x-ray was used. The parotid glands received the most intensive and the sublingual glands the least intensive radiation. There was a very rapid subsidence of the salivation and the patient went to term without any complications.

J. P. GREENHILL.

Nürnberg, L.: Irradiation of the Sex Glands and Posterity. *Monatsschrift für Geburtshilfe und Gynäkologie*, 1923, lxiii, 7.

This article is essentially an answer to Unterberger's paper on the same subject. The latter from experiments on animals came to the conclusion that irradiation of the ovaries produced a diminution in size of the offspring and also a diminution in their fertility. These effects were transmitted to subsequent generations; hence there was, according to Unterberger, transmission of acquired characteristics. Nürnberg bitterly assails Unterberger's data, experimental methods, analyses, etc., and concludes that even were Unterberger's conclusions correct they would not apply to the human being; for it has been definitely shown that in women irradiation of the sex glands does not produce any harm to the offspring.

J. P. GREENHILL.

Schwaab, A.: Again an X-Ray Child. *Presse Médicale*, 1924, No. 54, p. 566.

The patient, 40 years old, and married 10 years, had never been pregnant. She was found to have a large uterine fibroid. She preferred radiotherapy, which was instituted by a radiologist. In spite of the fact that she had not menstruated for seven weeks, 16 treatments were given over a period of about 3½ months, during which time the amenorrhoea persisted. At this stage a pregnancy of 4½ months was diagnosed by the author. The fetus developed poorly. A day before the calculated date of delivery labor began, and as delivery by the normal passages was absolutely out of the question, a classical cesarean section was performed, followed by hysterectomy. The child weighed 1620 grams, and was 43 cm. long. At the age of 4 months it weighed 2000 grams and gave the appearance of a premature infant of seven months. It was microcephalic, and had convergent strabismus. The prognosis, physically and intellectually, was not good.

The importance of carefully excluding pregnancy before subjecting such tumors to radiotherapy is stressed.

E. L. KING.

Abels, H.: Arrested Development In The Newborn Following Roentgen Ray Exposure During Pregnancy. *Wiener Klinische Wochenschrift*, 1924, xxxvii, 36.

The author reports the case of a quadripara who gave birth to a full-term baby on April 11, after having received Roentgen ray treatment for uterine bleeding during the preceding September. As evidence that the baby was full-term, he cites the fully developed nails, well developed and descended testes and the absence of lanugo. The baby was 41.5 cm. long and weighed 1950 gms. The head was typically microcephalic, there was double microcornea and microphthalmus. The penis was only 4.5 mm. long and contained no corpus cavernosum. The muscles of the lower extremities were slightly spastic. X-rays of the long bones showed changes suggestive of syphilis, but all other signs and symptoms of syphilis as well as the Wassermann reactions were negative.

The author compares this case to those reported by Aschenheim, Werner, and others who also felt that such deformities were due to x-ray exposures during early pregnancy.

RALPH A. REIS.

Driessen: Is the Child in Utero Injured by Roentgen Radiation of the Mother? *Nederlandsch Maandschrift voor Geneeskunde*, 1924, xii, 239.

Driessen feels that the evident difference between damage to the follicle or the ovum before its impregnation and that suffered by the embryo, has not been sufficiently emphasized. While Nürnberg concluded that the germinal cell is either entirely destroyed by the x-ray or escapes injury altogether, Driessen's experiments

on animals seem to prove the opposite. He found that while an ovum may retain enough vitality to become fertilized, it may nevertheless be permanently damaged. He found that the development of the embryos in rabbits which had been subjected to radiation was unmistakably interfered with. The duration of pregnancy in these animals was prolonged and the offspring below par. This agrees with the observations of Werner who found that women who had been irradiated before conception, frequently aborted and, in those cases where viable children were born, these had a tendency to lag in psychic and, more especially, in physical development.

That the embryo itself may be injured by the x-ray had already been pointed out by Perthes who claimed growth defects, malformations and monstrosities resulted from roentgen radiation of the embryo. Hertwig and his collaborators demonstrated that the exposure of frog embryos in the morulla stage to radium caused either gradual death or deformity of the central nervous system, depending upon the dose. Radiation in the gastrula stage caused spina bifida and other changes in the nervous system and blood. Most of these died a few days after maturity. Driessen exposed one side of pregnant rabbits to the x-ray. Invariably this produced death of the embryos in the radiated horn without any demonstrable histologic changes of the uterus or the corpora lutea.

While it has not been demonstrated that a single exposure, as used in making an x-ray picture of a pregnant woman, has any deleterious effect upon the fetus in utero, Driessen cautions that the making of repeated exposures may not be without definite danger to the child. He holds that therapeutic doses should only be given in urgent cases, such as in the treatment of carcinoma, and then with the distinct understanding that the fetus will probably be sacrificed.

R. E. WOBUS.

Martius, H., and Franken, H.: Damage of the Offspring of White Mice, Radiated before Mating. Zentralblatt für Gynäkologie, 1926, 1, 25.

Carefully selected, healthy white mice were subjected to x-rays about eight days before mating. The total number of offspring was reduced to less than half. Mortality of the offspring was greatly increased, growth and development definitely impaired. All were sterile after nine months, whereas all control animals, mated at four months, gave birth to normal litters later. These experiments made on mice do not prove anything in regard to the human being, but the possibility of similar damage to the human offspring by radiation without permanent sterilization is strongly suggested.

GROVER LIESE.

Schiller, W.: Full Term Pregnancy Following Roentgen Irradiation. Wiener Klinische Wochenschrift, 1924, xxxvii, 1190.

The author reports a case of a full term pregnancy following x-ray irradiation for myomata. The patient was 43 years old. During the puerperium she developed a temperature due to necrosis of the myomata, necessitating a supravaginal hysterectomy which was followed by an uneventful recovery. The baby has, up until the present time appeared normal in both its physical and mental development.

The author feels that this successful gestation was brought about by the x-ray therapy. The radiation resulted in the establishment of a normal endometrium which was able to maintain gestation once implantation took place. He feels that, if a reliable stimulating dosage of x-rays could be determined, many cases could become pregnant following such treatment, where no pregnancy could otherwise take place due to the presence of pathology of the endometrium.

RALPH A. REIS.

Naujoks, H.: Injuries to the Child Due to Roentgen-ray Therapy. *Monatsschrift für Geburtshilfe und Gynäkologie*, 1924, lxxiii, 40.

In September, 1921, a patient had an ovarian sarcoma removed and had roentgen-ray treatments after the operation for a long period of time. One or more treatments were given before it was discovered that the patient was pregnant. In August, 1922, the patient had a spontaneous labor without any complications. The child weighed 7 pounds and appeared normal. One year later, however, the child was underdeveloped and its head measured 39 cm. instead of 46 cm. In April, 1924, the patient gave birth to another child (her third). This child like the one born before the radiation was normal. The author believes therefore that in any case where in the early months of pregnancy large doses of roentgen-rays have been applied, abortion should be performed because the fetus is usually damaged.

J. P. GREENHILL.

Lüttge, W.: Indications for Temporary Roentgen-Ray Castration. *Monatsschrift für Geburtshilfe und Gynäkologie*, 1925, lxx, 306.

Up to the present time there is no practical operative procedure which will produce temporary sterility. Hence attention has been directed to the x-ray. The corpus luteum is the most resistant part of the ovary to the x-ray and the primordial follicle is more resistant than the graafian follicle. The accepted dose for temporary castration is 24 per cent of the skin dose. But changes in position of the ovaries of only 1 cm. may result in a dose of 30 to 32 per cent. Since 34 to 36 per cent is sufficient to produce complete and permanent castration, it is readily appreciated how careful one must be and how strict the indications for the use of x-ray should be made. Another disadvantage is the inability to measure exactly the depth of the ovaries. Furthermore the ovaries have a constantly changing blood supply which prevents exact dosage of the x-ray. For these reasons the author cautions against the use of the roentgen ray for purposes of castration.

J. P. GREENHILL.

Blacker: The Treatment of Menorrhagia by Radium. *Lancet*, 1923, cciv, 421.

Radium can be used for the treatment of menorrhagia in three conditions, viz., cases in which the bleeding is associated with the menopause, cases in which it is due to the presence of small fibromyomata in the uterus, in cases in which it occurs in young women who present no signs of general or pelvic disease. All these cases can be safely and sufficiently treated by the intrauterine application of radium, and this should always be employed in preference to any other measures when radium is available.

It is important to note that a sufficient number of cases of pregnancy with the birth of healthy children after the use of radium in young women have been reported to show that when the periods return normal, pregnancy may occur, and that there is no evidence that the children of such pregnancies are more likely to be mal-developed or deformed, although monstrosities can be produced in animals exposed to radium in the early weeks of pregnancy.

NORMAN F. MILLER.

Naujoks: Temporary Sterilization by the Roentgen Ray. *Zeitschrift für Geburtshilfe und Gynäkologie* 1923, lxxvi, 638.

He believes with Pankow that the resumption of ovarian activity following temporary cessation after a roentgen exposure is due to the ripening of undamaged primordial follicles rather than a restoration of slightly damaged follicles or a resumption of activity by the germinal epithelium.

There are four possible objections to the use of the x-ray as a means of temporary sterilization: (1) severe castration symptoms in young individuals, (2) lasting damage to ovarian function, (3) disturbances or abnormal course of future pregnancies, (4) damage to the offspring.

The last two objections are by far the most important, and the whole question of temporary sterilization rests on the fate of the later offspring. Experiments with radiation of the ova and spermatozoa of eels and frogs, showed serious malformations. Experiments with mammals showed greater danger of abortion but never malformations. Human cases are as yet comparatively few. Werner in 1921 collected 24 pregnancies after radiation. There were no malformations but possibly an increased tendency to abortion. Later observation of some of the children, however, suggested retardation of development; and although this may have been constitutional or accidental, final conclusions cannot be drawn until a considerable series of such children are followed to adult life and reproductive activity.

MARGARET SCHULZE.

Gauss: Can a Temporary Roentgen Amenorrhea be Established Uniformly and by Rule? *Zeitschrift für Geburtshilfe und Gynäkologie*, 1924, lxxxvii, 453.

The writer's conclusion from animal and clinical experiments is that while the developing follicles are killed and the nearer maturity they are, the more easily the primordial follicles are either uninjured, in case of small doses, or also killed, in case of larger ones, but never crippled, a fact of the utmost importance in the decision as to the advisability of attempts at temporary sterilization.

From the careful study of cases in which temporary amenorrhea of varying duration has been induced, others in which the amenorrhea has been permanent, and still others in which menstruation has merely been influenced temporarily, the author has been able to establish fairly definitely the relation between the necessary dose, the duration of amenorrhea desired, the age of the patient and the type of disease. He has compiled tables which state this relation, and although many further observations will be required to make them accurate, he feels that in time very definite dosages may be established for the individual patient.

MARGARET SCHULZE.

Watkins, Thomas J.: Radium for Non-Malignant Gynecologic Diseases. *Wisconsin Medical Journal*, 1924, xxiii, 123.

The author gives his experiences with radium in 1050 cases.

He summarizes as follows:

Radium is a specific remedy for the hemorrhage of the menopause and is the remedy of choice for selected cases of uterine fibroids. It will cure some 80 per cent of obstinate cases of chronic cervical erosion with leucorrhea.

Radium should be used with caution in the young, lest the ovaries be damaged and the fetus deformed in case of pregnancy. Burns can be avoided, as with the x-ray, by care relative to dosage and screening.

F. J. SOUBA.

Jones, Thomas E.: The Role of Radium in Benign and Malignant Tumors of the Uterus. *Wisconsin Medical Journal*, xxii, 1924, 466.

In the Cleveland Clinic at the present time all cases of carcinoma of the cervix are being treated with a combination radium and deep x-ray therapy. Carcinoma of the fundus should be treated by surgery. Fibroids associated with pain in the pelvis or with discharge from the uterus, the cervix being normal, should not be

radiated. Radium is the treatment of choice for menorrhagia at any age; it is especially indicated in cases of menorrhagia at the menopause with slight enlargement of the uterus.

F. J. SOUBA.

Martindale, Louisa: Treatment of Fibromyomas of the Uterus and other Causes of Menorrhagia. *Journal of American Medical Association*, 1924, lxxxiii, 1057.

The writer reports his results in the treatment of fibroids, fibrosis uteri and climacteric hemorrhages; 126 were treated operatively, 87 with intensive roentgen-ray therapy. Ninety-five and five-tenths per cent of the cases treated with roentgen ray resulted in cure. The failures were operated on, but nothing accounting for the failure could be found. The author concludes that as long as one's diagnosis necessarily remains faulty, there is a certain danger in using extensive roentgen-ray therapy for any but those cases in which we are fairly certain that we are dealing with an uncomplicated case, e.g., a fibroid uterus well under size of a six months' pregnancy, interstitial rather than subperitoneal. In all cases that are at all doubtful in diagnosis, operative treatment is advised.

GROVER LIESE.

Nemec, Elo: X-Ray Results in the Treatment of Fibroids and Uterine Hemorrhages. *Bratislavske Lekarske Listy*, 1925, v, 12.

Such treatment consists either in direct or indirect application of the rays, either directly to ovaries or uterus, or indirectly to spleen, hypophysis and thyroid. Direct treatment was resorted to in all cases of uterine fibroids. Indirect irradiation, advocated by some writers, for the treatment of fibroids was not used because the results so far reported in literature are far from encouraging.

Out of a total of 53 cases of uterine hemorrhage, in 36 both ovaries, in 11 the spleen, and in 6 but one ovary were radiated. Ovarian treatment is a reliable method but should be done in younger women with greatest care since it might result in sterilization. The result of unilateral ovarian irradiation depends only upon the fortunate selection of the correct side. Spleen treatment does not seem to act as a specific; and though it acts quickly, the effect is but short lived.

AUTHOR'S ABSTRACT.

Benthin, W.: Limitations and Dangers of Conservative Therapy in the Treatment of Gynecologic Ailments with Special Reference to Roentgen-Ray Therapy. *Medizinische Klinik*, 1926, xxii, 719.

The conservative treatment of pelvic inflammations is not always successful, regardless of whether the therapy consists of local heat, protein injections, baths, etc. The same holds true for the treatment of certain gynecologic ailments by means of psychotherapy.

The largest proportion of failures is obtained in the treatment of disorders of the endocrine glands. This is most likely due to the fact that the symptoms of an endocrine disturbance such as leucorrhea, dysmenorrhea, menorrhagia, amenorrhea, sterility, etc., are considered to be of endocrine origin only when all other etiologic factors have been exhausted. Even roentgen-ray therapy has done very little good, and in many instances it has done harm. In outspoken cases of hypoplasia, no improvement has been produced by the x-ray and even in cases of climacteric hemorrhages serious bleeding recurs very frequently after treatment.

The dangers from the Roentgen ray are numerous and not all are known. Aside from the damage to the skin and to the intestines from an overdose, there are other dangers. Numerous examinations of the blood have shown that the general reaction does not parallel the indicated dose but is dependent upon the activity of the blood-

forming organs. Even concerning the action of the Roentgen ray on the ovaries very little is definitely known. We cannot determine beforehand whether the function of the ovaries will be entirely destroyed or only temporarily discontinued.

Because the dosage of the x-ray cannot be determined with accuracy due to the difference in individual reactions and because damage cannot always be avoided, we should employ x-ray treatment only for strict indications. Before using the Roentgen ray one should make certain the patient is not pregnant because the fetus can be injured. The only real general contraindication to x-ray treatment is severe anemia because the styptic effect of radiation does not manifest itself until sometime after treatment.

J. P. GREENHILL.

Tuffer, Th.: Attempted Protection of the Ovaries (Occultation) in the Treatment of Uterine Fibroids by the X-ray. *Presse Médicale*, Nov. 24, 1926, p. 1473.

The ideals to be attained in x-ray therapy of uterine fibroids are: (1) to cause regression of the growth; (2) to stop the hemorrhages; (3) to cure the patient while conserving the ovarian function and the uterine mucosa, the latter of particular importance for young women. In an attempt to meet these requirements he has devised the following method:

Laparotomy is performed. If exploration demonstrates the impossibility of enucleation of the tumor or tumors, the ovaries are enclosed in hinged, egg-shaped lead shells, with walls 0.003 mm. thick, having a fissure at one end large enough for the free passage of the vascular pedicle. These shells are reinforced with a layer of aluminum, and on the free border are little orifices which permit the halves of the shell to be sutured together and to be fixed to the broad ligament or to the uterus. The abdomen is closed and a skiagraph taken later. The position of the shells serves as a guide to the employment of the x-ray. After the series of radiotherapeutic treatments is concluded, the lead shells are removed by a second laparotomy; this is the chief disadvantage of the method. The author notes that possibly other radiosensitive organs, e.g., the suprarenals, may be protected in a similar manner when neighboring organs must be radiated.

Three patients have been treated by this method. The first attempt was a failure; the growth increased in size, and myomectomy was required three months later. The menorrhagia, however, had been controlled. In the other two patients the menorrhagia was still under control at the end of a year, but there was little or no diminution in the size of the tumors.

The number of cases in which this method is applicable is small.

E. L. KING.

Wielach: Stimulative Roentgen Radiation of the Ovaries. *Zeitschrift für Geburtshilfe und Gynäkologie*, 1924, lxxxvii, 1.

The authors began the use of very small doses ($\frac{1}{10}$ to $\frac{3}{10}$ of the castration dose) of x-ray in a series of cases of ovarian hypofunction. In seven cases of primary or secondary amenorrhea there was no result. In two cases slight menstruation appeared many months after the radiation, too long to be regarded as a certain result of it, but at least indicating that in these cases $\frac{1}{10}$ of the castration dose had done no damage. In the second group of oligomenorrhea (irregular and infrequent slight menstruation), only one of seven cases showed permanent improvement, one was temporarily benefited, three were made worse, two were not influenced. The age in these cases seemed to play no rôle, and as far as dosage went, $\frac{1}{10}$ of the castration dose seemed as likely to harm as $\frac{3}{10}$ to benefit.

The third group of hypomenorrhea (regular but scanty menstruation) comprises 11 cases, of which some were radiated as often as five times, the dosage being from $\frac{3}{10}$ to $\frac{2}{5}$ of the castration dose. Two cases showed no result, eight were improved, one made worse. Three of these cases have been under observation less than a year, hence the permanent result cannot as yet be stated. It appears though, that the more marked the hypofunction, the more difficult it is to influence it favorably, and the easier it is to completely damage the slight function present. Cases must, therefore, be carefully individualized; and where no results are obtained with slight dosage, further treatment should not be undertaken.

MARGARET SCHULZE.

Hirsch: Further Experience in Radiation of the Hypophysis. Zentralblatt für Gynäkologie, 1924, xlviii, 76.

Hirsch is unable to confirm Werner's opinion that small dose radiation of the hypophysis influences favorably amenorrhea, dysmenorrhea and climacteric conditions; although he considers these results very probable. Similar favorable results may be obtained through other measures without the dangers incident to radiation. He is unable to prophesy any therapeutic future for this form of radiation; although experimentally as an aid to determining relations between the hypophysis and other endocrins, and occasionally for influencing the vegetative center in the floor of the third ventricle, and for demonstrating the multifarious relations between hypophysis and genitalia, it is important. There is need of further proof whether the radiation works directly on the hypophysis and thereby influences the center by means of secretion induced, or whether the influence is directly on the center itself.

LITTLE.

Items

JOINT COMMITTEE ON MATERNAL WELFARE

A meeting of the Joint Committee on Maternal Welfare was held in Detroit, October 3 and 4, 1927, representatives being in attendance from all of the constituent bodies. The Chairman, Dr. Fred L. Adair, presided. The two sessions were largely given over to a study and discussion of "Standards of Intrapartum Care," prepared by Dr. W. C. Danforth, of Evanston, Ill. It was resolved to publish these in pamphlet form for distribution to the medical profession through various sources, similar to the "Standards of Prenatal Care" previously circulated. A pamphlet on postpartum care along the same lines is likewise under preparation.

WOMAN'S HOSPITAL, NEW YORK

The following promotions on the surgical staff are announced:

Dr. Dougal Bissell, who has retired on account of the age limit, was made Consulting Surgeon.

Dr. Byron H. Goff, Attending Surgeon.

Dr. Lilian K. P. Farrar, Attending Surgeon.

Dr. Albert H. Aldridge, Junior Attending Surgeon.

Dr. William P. Driscoll, Adjunct Assistant Surgeon.

